Enhanced VGA

Enhanced Video Graphic Adapter

User's Manual

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The information in this document is subject to change without notice.

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PREFACE

CONGRATULATIONS! You have chosen one of the most modern Video Graphic Adapter available in the market today. The Enhanced Video Graphic Adapter is designed for the 80386/80486 Local Bus mainboard. In addition to the IBM VGA standard, this Enhanced Video Graphic Adapter offers more advanced features: the 1280x1024 in 16 colors, 1024x768 in 256 colors, 1024x768 in 16 colors, 800x600 in 256 colors, 800x600 in 16 colors, 640x480 in 256 colors, 800x600 and 640x480 32K/64K Hi-Color (option) high resolution, flicker free, register level compatibility with VGA, EGA, CGA, MDA and Hercules, 132 column text display.

Please check that your Enhanced Video Graphic Adapter carton contains the following items:

- Enhanced Video Graphic Adapter Board
- Utility & Driver Diskette
- User's Manual

Please take the time to read the User's Manual. Failure to read the manual's instructions may void our warranty.

In the event you experience difficulty in using this product, please review CHAPTER 5 TROUBLESHOOTING before making final decision to return the Enhanced VGA board to your dealer. If you do decide to return this Adapter, please return the board and its components in their original packing.

CHAPTER 1

INTRODUCTION

Congratulations on the purchase of your Enhanced Video Graphic Adapter (short as Enhanced VGA in the following paragraph), you have got one of the most advanced Video Graphic Adapter available today. The Enhanced VGA is designed based on the ET4000 graphic controller, used on the 80386/80486 Local Bus mainboard. The followings are the enhanced features:

1-1 Features

- Support 80386/80486 Local Bus interface up to 50MHz
- Resolution up to 1280x1024, 16 colors out of 256K colors, interlaced mode
- Support resolution 1024x768, 256 colors out of 256K colors , interlaced mode or non-interlaced mode
- Based on Tseng Labs' ET4000 VGA chip design
- Register level compatible with VGA, EGA, CGA, MDA and Hercules standard
- Converts various Video frequencies of the pre-VGA standards to VGA frequency and running all pre-VGA software standards on a 31.5KHz VGA monitor
- Support 132 column text display
- Provide multiple soft Fonts Editor and Loader Utilities
- Provide software drivers for 1-2-3, Symphony, Auto-CAD, Autoshade, Windows, Ventura Publisher, GEM, Wordperfect, OrCAD, PCAD, VESA BIOS Extension and 8514/A Emulation
- Support 70 and/or 72Hz Vertical Refresh in 640x480 operation mode
- Support 72Hz Vertical Refresh in 800x600 operation mode
- Support 70Hz Vertical Refresh in 1024x768 non-interlaced operation mode
- Provide turbo display memory access

- Support resolution 800x600 and 640x480 with 32K/64K Hi-Color mode(option).

In a moment we will take you through the installation procedure step-by-step, but at first we would like to take a moment to familiarize you with some of your new board's special features.

1. VGA Compatibility

The Enhanced VGA in register level is compatible with IBM Video Graphics Array (VGA) standard. It means that all software written for IBM PS/2 systems and the VGA standard are workable on this adapter. Users can interface the IBM 8503, 8512, 8513 and 8514 analog monitors or functionally equivalent monitors as well as variable-frequency monitors (in analog mode) with their current personal computer systems using the Enhanced VGA.

2. EGA Compatibility

The Enhanced Video Graphic Adapter is compatible with IBM Enhanced Graphics Adapter (EGA) standard in both BIOS level and register level.

According to IBM specification, VGA provides EGA compatibility at BIOS level. It means that a VGA board will run most, but not all, off-the-shelf EGA software. The Enhanced VGA configured as a VGA adapter provides the same EGA compatibility as the IBM VGA. However, user can have full EGA compatibility down to register level by configuring this adapter as an EGA adapter.

The Enhanced VGA is a complete, easy replacement for the VGA, EGA and much more.

3. CGA/MDA Compatibility

The Enhanced VGA is compatible with IBM Color/Graphics Adapter (CGA) and the IBM Monochrome Display Adapter (MDA) standards in BIOS level. This Adapter offers the same CGA/MDA compatibility offered by IBM VGA to protect the investment of time and money presented by your current CGA/MDA software library.

4. Extended Graphics Modes

The Enhanced VGA provides the following graphics mode which are not available from the IBM VGA:

640 x 350, 256 colors out of 256K palette
640 x 480, 256 colors out of 256K palette
800 x 600, 16/256 colors out of 256K palette
1024 x 768, 16/256 colors out of 256K palette
1280 x1024, 16 colors out of 256K palette
640 x 480, 32K/64K colors (option)
800 x 600, 32K/64K colors (option)

5. 132-column Text Display

The Enhanced VGA provides 132-column x 25/28/44 lines text display for Lotus 1-2-3, Symphony, Wordstar, Wordperfect.... etc. on variable frequency monitors and IBM 5154 or functional equivalent monitors which are not available from the IBM VGA.

The 132-column feature also lets your micro-computer emulate the display characteristics of widely used terminals such as DEC VT100 and IBM 3278 which require 132 columns of text by using popular emulator and micro mainframe link products.

6. Flicker-Free Mode

The Enhanced VGA could support 70 and/or 72Hz Vertical Refresh in 640x480, 72Hz Vertical Refresh in 800x600 and 70Hz Vertical Refresh in 1024x768 non-interlaced operation mode

7. Turbo Display Memory Access

The Enhanced VGA provides turbo display memory access. The function gives you the highest speed in display memory access.

We built the Enhanced VGA for the future, with powerful features as mentioned above. Software developers are working to integrate these features into their products to make your Enhanced VGA an even better value. The Enhanced VGA represents the latest in state-of-the-art Video Adapter.

1-2 Quick Installation Guide

Analog Operation

If an analog monitor (eg. IBM VGA or NEC Multisync monitor) is connected to the Enhanced VGA through 15 pin analog connector, please do the following:

Switch off your PC and plug the Enhanced VGA into the Local Bus slot.

This is all you need to do to run any VGA software.

Remark

1. Analog Sensing

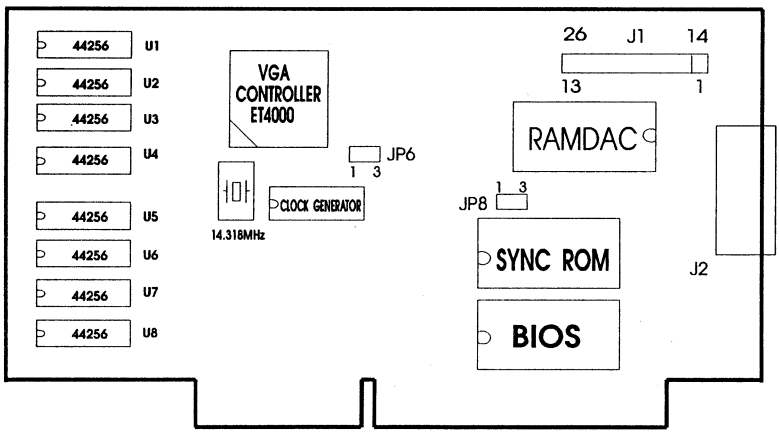
   When your PC power is turned on, your Enhanced VGA will sense if its 15-pin analog connector is active (connected). If yes, the Enhanced VGA will set itself to be VGA mode.

2. Software Mode Switching

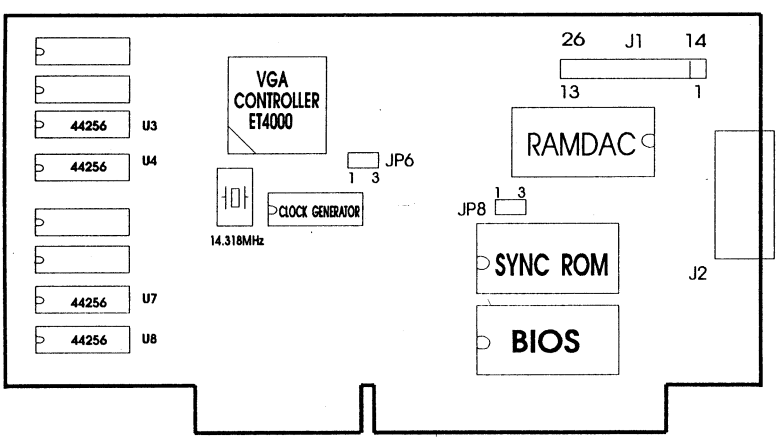
   For software mode switching, please use **DMODE** or **BMODE** utility program to switch modes (VGA, EGA, CGA, MDA or Hercules). Please note that the adapter's current mode will not be reset by warm-booting (Ctrl-Alt-Del) the PC. This is a planned function for user's convenience. To switch modes, please use **DMODE** or **BMODE** utility or turn-off the PC.

DRAM placement for 1MB, 512KB or 256KB memory

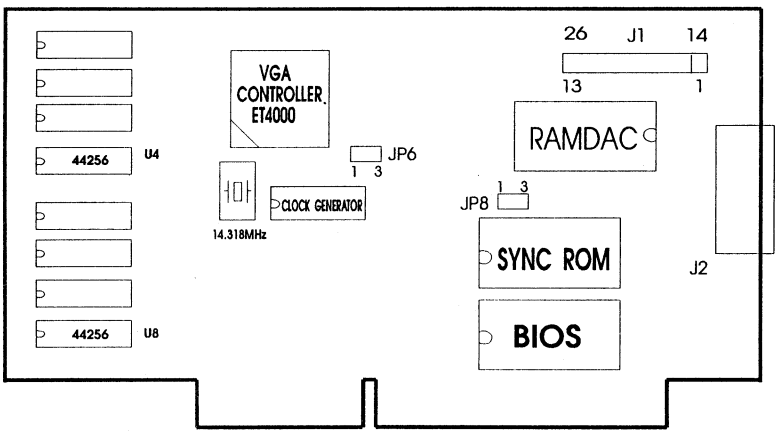
Enhanced VGA with 1MB memory



Enhanced VGA with 512KB memory



Enhanced VGA with 256KB memory



Memory Size

Your Enhanced VGA consists of either 256KB DRAM, 512KB DRAM or 1MB DRAM. The size of memory on the adapter determines the graphics resolutions and number of colors the adapter provides.

The following resolutions/colors require 256KB DRAM:

- 320 x 200 in 256 colors
- 640 x 350 in 16 colors
- 640 x 480 in 16 colors
- 800 x 600 in 16 colors

The following resolutions/colors require 512KB DRAM:

- 640 x 480 in 256 colors
- 800 x 600 in 256 colors
- 1024 x 768 in 16 colors

The following resolutions/colors require 1MB DRAM:

- 1024 x 768 in 256 colors
- 1280 x1024 in 16 colors
- 640 x 480 in 32K/64K colors (option)
- 800 x 600 in 32K/64K colors (option)

Memory Type and Speed

The Enhanced VGA uses 256Kx4 (44256) DRAM. 2 pieces of 256Kx4 DRAM will be 256KB, 4 pieces of 256Kx4 DRAM will be 512KB, and 8 pieces of 256Kx4 DRAM will be 1MB.(DRAM speed of 80 nanosecond access time is recommended.)

1024x768 Interlaced Mode and Non-interlaced Mode

The Enhanced VGA supports both interlaced mode (horizontal frequency is 35.5KHz) and non-interlaced mode (horizon-tal frequency is 48.5KHz) in 1024x768 graphics mode. The Enhanced VGA default setting is 1024x768 interlaced mode. If you need to change the interlaced mode to non-interlaced mode, please refer to the DMODE utility program of the 3-1 section "The Software On Your Enhanced VGA Utility & Driver Diskette" on the page 3-2.

Flicker-Free Display Mode

The Enhanced VGA could support 70 and/or 72Hz Vertical Refresh in 640x480, 72Hz Vertical Refresh in 800x600 and 70Hz Vertical Refresh in 1024x768 non-interlaced operation mode. If you need to use the mode, please refer to the DMODE utility program of the 3-1 section "The Software On Your Enhanced VGA Utility & Driver Diskette" on the page 3-2.

Extended Resolution and Colors on Standard Mode

The Enhanced VGA ensures the compatibility with extended VGA modes on any of monitor frequency standards, while many other VGA cards are not always met the monitor standards in 1024x768 resolution or 256 colors mode.

Following is a list of standard display frequencies and frequencies of 70Hz/72Hz display of various resolutions that your Enhanced VGA Adapter can offer.

GRAPHICS MODES			
Mode_No.	Resolution	Color	Refresh_Rate
12	640x480	16	60Hz/70Hz/72Hz
2E	640x480	256	60Hz/70Hz/72Hz
29	800x600	16	43.5Hz/56Hz/60Hz/72Hz
30	800x600	256	43.5Hz/56Hz/60Hz/72Hz
37	1024x768	16	43.5Hz/60Hz/70Hz
38	1024x768	256	43.5Hz/60Hz/70Hz

Please make sure that your monitor is capable for supporting the frequncies required.

Resolution	Horizontal Frequency	Vertical Frequency
640x480	31.5 KHz	60Hz
640x480	35.5 KHz	70Hz
640x480	38 KHz	72Hz
800x600	31.5 KHz	87Hz (43.5Hzx2)*
800x600	35.5 KHz	56H
800x600	38 KHz	60H
800x600	48.5 KHz	72H
1024x768	35.5 KHz	87Hz (43.5Hzx2)*
1024x768	48.5 KHz	60H
1024x768	56.5 KHz	70H
1280x1024	48.5 KHz	87Hz (43.5Hzx2)*

* Interlaced display

CHAPTER 2

INSTALLATION

THE ENHANCED VGA INSTALLATION INSTRUCTION

Important: If necessary, consult the user's manual for your computer and any other devices you may have attached to it before you perform the following steps.

1. Power OFF all devices (printer, display, modem, etc.) you may have attached to your computer.

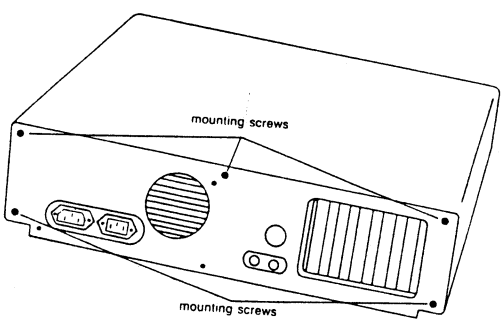
2. Power OFF your computer system.

   Before you do the next step
   Please make sure which cable goes in which connector before disconnecting it.

3. Disconnect all cables from the rear of your computer.

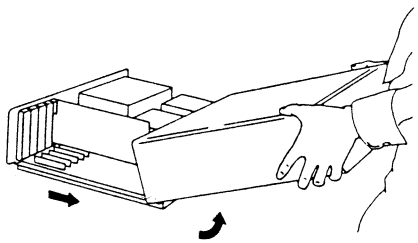
4. Turn your computer to face its back.

5. Use flat-blade screwdriver or 1/4 inch nutdriver to remove the cover mounting screws. Save the screws for reinstalling the cover.



6. Now turn the computer so that its front faces you.

7. Carefully slide the computer cover towards you. When the cover will not go any further, tilt it upward and gently lift it away from the computer.



8. Look at the Enhanced VGA and locate the jumper.

9. The Enhanced VGA provides one video connector, the 15-pin (DB15) analog connector. The 15-pin (DB15) connector is interfacing this board with analog monitor such as IBM PS/2 monitor (IBM 85xx) or variable frequency monitor (analog mode).

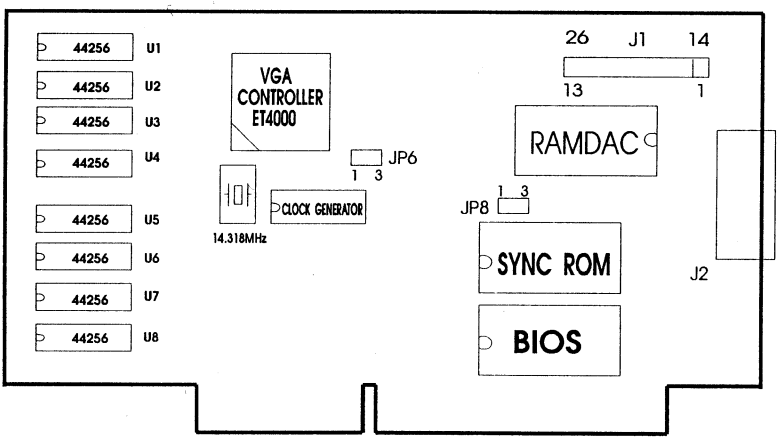
   The following chart shows the display monitors that may be attached to the Enhanced VGA and maximum displayable resolution capabilities.

ENHANCED DISPLAY MODES		COMPATIBLE MONITORS		
RESOLUTION	COLORS	VERTICAL REFERSH RATE	HORIZONTAL RATE	MONITOR EXAMPLE
640x480	16 or 256/256K	60 Hz	31.5 KHz	VGA
		70 Hz	35.5 KHz	NEC Multisync 2A
		72 Hz	38 KHz	NEC Multisync 3D
800x600	16 or 256/256K	43.5Hz	31.5 KHz	NEC Multisync 2A
		56 Hz	35.5 KHz	NEC Multisync 2A
		60 Hz	38 KHz	NEC Multisync 3D
		72 Hz	48.5 KHz	NEC Multisync 4D
1024x768 (interlaced)	16 or 256/256K	43.5Hz	35.5 KHz	NEC Multisync 2A
1024x768 (non-interlaced)	16 or 256/256K	60 Hz	48.5 KHz	NEC Multisync 4D
1024x768 (non-interlaced)	16 or 256/256K	70 Hz	56 KHz	NEC Multisync 5D
1280x1024 (interlaced)	16/256K	43.5Hz	48.5 KHz	NEC Multisync 4D

* Compatible analog variable frequency monitors include the Mitsubishi Diamond Scan, NEC MultiSync, Sony Multiscan, Thomson Autoscan, and others.

NOTE: Display monitors which are compatible with the above displays can be used with the Enhanced VGA. Check with your dealer to ensure the compatibility of any particular display. The 1024x768 mode requires an analog monitor such as NEC MultiSync XL,IBM 8514 display monitor or functional equivalents.

CONNECTOR AND JUMPER LOCATION



Enhanced VGA (P/N:2148)

- J1 - VESA Standard Feature Connector
- J2 - Video Display Connector
- JP6- IRQ2 Line Status
- JP8- CPU Speed Select

JUMPER SETTING

POSITION	JP6 IRQ2 Line Status
1-2	IRQ2 Disable (Default)
2-3	IRQ2 Enable

POSITION	JP8 CPU Speed Select
1-2	CPU Speed 40MHz to 50MHz
2-3	CPU Speed up to 33MHz (Default)

CONNECTOR INFORMATION

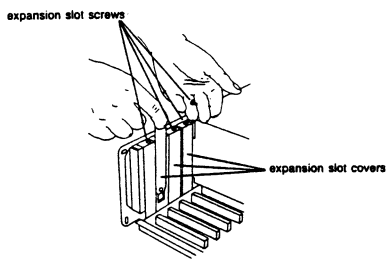
Direct Drive Video Display Connector (DB15-S)		
CON1	**SIGNAL NAME - DESCRIPTION**	**PIN**
Direct Drive Video Display	Red	1
	Green	2
	Blue	3
	Monitor ID bit 2	4
	Ground	5
	Ground	6
	Ground	7
	Ground	8
	Not Used	9
	Ground	10
	Monitor ID bit 0	11
	Monitor ID bit 1	12
	Horizontal Sync	13
	Vertical Sync	14
	Not Used	15

IMPORTANT: The Enhanced VGA uses the same 15-pin (DB15) cables available from monitor manufacturers to interface with the IBM PS/2 computers. Maximum performance is provided by analog variable frequency monitor.

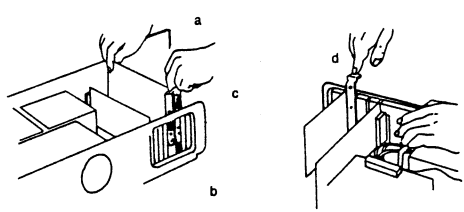
10. The Enhanced VGA is intended for maximum performance of analog output. Please avoid interfacing monitors with the adapter incorrectly.

11. The Enhanced VGA may be installed in the Local Bus slot on the mother board. Choose the slot you want to hold the Enhanced VGA.

12. Remove the screw which holds the chosen expansion slot rear panel cover. Remove the cover and set the screw and cover aside.



13. At this point, you are ready to install your Enhanced VGA into the system. Refer to the following pictures when you do steps 13.a through 13.d.



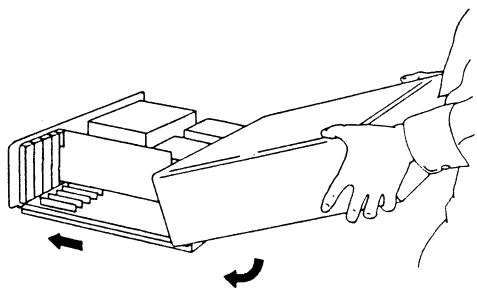
a. Hold the top corners of the Enhanced VGA and slide it into your computer.

b. Firmly press the Enhanced VGA expansion slot connector into the expansion slot you've chosen, make sure that the board edge connector is seated in the slot.

c. Line up the hole on the top of the retaining bracket on the board with the threaded hole on the lip of the computer rear panel.

d. Insert the screw that was removed from the expansion slot rear panel cover (reverse of Step 12) and tighten it firmly.

14. Hold the computer cover as shown in the figure below, with its front facing you, tilting down in the back. Slip the upper rear edge of the cover over the top of the computer front panel.



15. Lower the cover and carefully slide it back over the computer. Be sure that the lips along the bottom of the cover slide along the rails on each side of the computer chassis.

16. Install the five mounting screws (reverse of Step 5) that hold the cover to the computer.

17. You are now ready to reconnect all cables (reverse of Step 3) to the rear of the computer. If necessary, refer to the instructions supplied with your display monitor, printer or other equipment.

18. After you reconnect all the cables, refer to the documentation provided with the computer to learn how to turn on and use your computer.

CHAPTER 3

APPLICATION SOFTWARE

3-1 The Software On Your Enhanced VGA Utility & Driver Diskette

A program diskette comes with your Enhanced VGA. It is refered to as the Utility & Driver Diskette, and it includes several routines similar to some utilities found on your DOS diskette. Following are descriptions of these Enhanced VGA utilities and other files.

INSTALL.BAT -- installs the files on the Utility & Driver Diskette provided with your VGA board onto your PC-/MS-DOS operating system diskette or fixed disk drive.

VDIAG.EXE -- is a diagnostic file that tests the video modes of the Enhanced VGA and details the configuration of the system. This test can also be used to check/align your display monitor screen.

DMODE.EXE -- used to switch the Enhanced VGA display modes.

DMODE ? -- will display current Vidoe Environment Information

DMODE MODE? -- will display table of extended mode

DMODE COMMAND? -- will display all the commands provided by DMODE

FASTBIOS.SYS -- speeds up video BIOS operations when use 80286- and 80386-based systems. Must be installed as the FIRST device in the CONFIG.SYS file. (see installing the FASTBIOS.SYS Device Driver)

EANSI.SYS -- replaces the ANSI.SYS device driver supplied on your DOS system disk. EANSI.SYS is compatible with the standard ANSI.SYS, and additionaly supports the extended screen modes provided by the Enhanced VGA board.

FEDIT.COM -- the font editor, used to create new fonts and/or modify existing fonts. User's .FNT font files are also included on your Utility & Driver Diskette.

FLOAD.COM -- the font loader, used to load a selected font into video memory from disk.

README.DOC -- contains additional information. It may contain instructions for using new Enhanced VGA utilities or other information which was not available at the time this manual was printed.

3-2 Installing The Enhanced VGA Utilities

To Install your Enhanced VGA utility software, simply copy the VGA Utility Diskette onto your PC-/MS-DOS operating system diskette or fixed disk drive. Please remember to back up your Utility & Driver Diskette before using it!

NOTE

Refer to your DOS Manual if necessary when you follow these steps to install your Utility & Driver Diskette.

1. Boot the system.
2. Insert the Utility & Driver Diskette into drive A.
3. At the DOS prompt type **A:** then press **ENTER.**
4. Invoke the installation of the Enhanced VGA utilities with the INSTALL command.

EXAMPLE

To install the Enhanced VGA utilities on the "B:" drive, insert a bootable PC DOS diskette(created with the FORMAT/S command) into drive "B:" then type:

INSTALL B:

To install the Enhanced VGA utilities on the "C:" drive under the directory \UTIL type:

INSTALL C:\UTIL

3-3 Using The Enhanced VGA Utilities

When you installed the Enhanced VGA utilities, you used the INSTALL.BAT utility. The following are instructions for how to use the remaining Enhanced VGA utilities.

NOTE

Your DOS Manual contains explanations of common terms, and instructions for how to perform common operations (such as checking your disk directory). Refer to your DOS manual if necessary when you perform the steps outlined in the remainder of this section.

Diskettes containing software drivers for popular commercial programs are included. These drivers permit the use of the Enhanced VGA's high-resolution modes after properly configured. See following instructions to load these drivers.

3-4 Using The Extended Column Modes

The Enhanced VGA provides you capability to utilize extended column modes with text applications. It means that your Enhanced VGA board, when interfaced with appropriate color displays, can produce 132x44, 132x28, 132x25, 100x40, and 80x60 modes in addition to the standard 80x25 and 40x25 modes. With the appropriate software, the 132-column display capability allows to emulate terminals which require 132 columns of text.

With the Enhanced VGA Adapter, you can switch back and forth between the 80-column display modes and the various extended-column display modes.

To use DMODE, follow these steps:

1. First, be sure that the DMODE.EXE utility is present on the disk you are using.

2. To switch to the mode you wish to use by typing following command and then press **ENTER**:

DMODE 23 - to switch to 132x25 mode
DMODE 24 - to switch to 132x28 mode
DMODE 22 - to switch to 132x44 mode
DMODE 2A - to switch to 100x40 mode
DMODE 26 - to switch to 80x60 mode
DMODE 3 - to switch to 80x25 mode
DMODE 0 - to switch to 40x25 mode

3-5 Using The Compatibility Modes

Some programs are written to be run under specific modes or are written according to particular video standards. For example, there are programs that require a monochrome adapter or are written exclusively for a Color Graphics Adapter. When these kinds of programs are used, it becomes necessary to make your Enhanced VGA board to be the mode what the program requires. This is easily accomplished. In order to select a mode that will change the "appearance" of the video adapter to the software, you only need to select the appropriate DMODE parameter. When another mode is needed or desired, you can simply select the mode using another DMODE parameter. In order to return to the default mode (VGA), type **DMODE VGA** or power down (the VGA mode will be in effect upon power-up). The following is a list of modes and their uses. Please refer to the BIOS FUNCTION CALLS of the chapter 4 "ADVANCED INFORMATIONS" of the page 4-5 for a complete list of available modes.

DMODE CGA- To set the adapter for compatibility with the Color Graphics Adapter.

DMODE MDA- To set the adapter for compatibility with the Monochrome Display Adapter.

DMODE EGA- To set the adapter for compatibility with the Enhanced Graphics Adapter.

DMODE VGA- To set the adapter for compatibility with the Video Graphics Array.

Usually a typical game software reguires CGA display under this situation, using DMODE CGA to switch Enhanced VGA board from VGA mode to CGA mode, then warm-boot with your game diskette in the A:drive. The game is now workable.

You may switch modes in this manner as often as you wish.

3-6 DMODE.EXE FOR SOFTWARE MODE SWITCHING

Your Enhanced VGA Adapter is designed to provide compatibility with following modes: IBM's VGA, EGA, CGA, MDA and Hercules mode.

DMODE.EXE is the utility program which is used to switch display modes after the PC is turned-on. Because your Enhandced VGA Adapter supports various types of monitors, various display standards (VGA, EGA, CGA, MDA, Hercules) and various display formats (132-column text, high resolution graphics, etc.), user has to properly set the card into the specific mode desired via DMODE. Or one may experience incompatibility difficulties with software being used.

DMODE is an easy-to-use, menu-driven program. To execute DMODE at DOS prompt, the following screen will appear.

Ver 2.4	Display Mode Setup (DMODE)		07/15/91
--FEATURE--	-- OPTION ----------	--FEATURE--	-- OPTION ----------
Monitor 1	Multisync-Analog	Gray Scale	OFF
Monitor 2	None	Memory Size	1024 KB
Adapter	VGA	I/O Bus	16-bit
Mode	03 Format : 80x25 16 Colors Text Mode		
Refresh Rate	70 Hz [FIXED]		
Operation : Please Press [◄] or [►] key to select Refresh Rate			
[▲▼ ◄►] : Select a FEATURE [SPACE] : Select next OPTION [BK-SP] : Select last OPTION [ENTER] : Execute OPTION		[F1] : Video Information [F2] : Advanced Features [F10] : To mode 3 or last mode [Esc] : Activate OPTION and exit	
(C) TsengLabs International 1991. All Rights reserved.			

User may simply move cursor to select the monitor used, desired adapter and display mode. Press **ENTER** key to execute option. Of course, you can also select gray scale, memory size and I/O bus to meet your requirement.

An easy to understand on-screen operation instruction is included and will guide you through all steps.

NOTE

If you wish to return to the default VGA mode after operating under other display mode, please run DMODE to choose VGA again, and be sure to "warm-boot" (by pressing CTRL-ALT-DEL) your PC after selection.

In most of the casea, the PC will be operated under the same conditions which are selected right before "warm-boot"

SELECTING 1024X768 Interlaced or Non-Interlaced Graphics

Your Enhanced VGA Adapter provides the capability to display 1024x768 graphics resolution in interlaced (default mode) and non-interlaced mode. The output frequency of 1024x768 interlaced mode is 35.5KHz/ Horizontal, 87Hz(43.5Hz x 2)/Vertical; non-interlaced is 48.5KHz/Horizontal, 60Hz/Vertical. You can select mode 1024x768 in interlaced or non-interlaced mode via DMODE utility.

Selecting mode **37h** in DMODE menu represents 1024x768 16 Colors Graphic Mode and mode **38h** represents 1024x768 256 Colors Graphic Mode. Both mode 37h and 38h can be either interlaced or non-interlaced. **Interlaced/non-interlaced is a sub-option under mode 37h and 38h. The default is in interlaced mode.**

After you have selected mode 37h or 38h, continue pressing the right arrow key on the keyboard (->) will change the selection form interlaced to non-interlaced. Vice versa, if you selected non-interlaced, pressing left arrow key (<-) will change your selection back to interlaced mode.

After the selection, you can either press **ENTER** or **Esc**. Pressing **ENTER** will **immediately** skip your screen to the selected mode. Pressing **Esc** instead will leave the screen in the current mode that you are in, i.e. 80x25.

The selection of interlaced/non-interlaced is to notify the Enhanced VGA Adapter's BIOS your choice of 1024x768 graphic. After selection, you can press **Esc** and start running your application software under the selected interlaced or non-interlaced 1024x768 mode, if provided software driver for 1024x768 is properly installed. You can switch between interlaced and non-interlaced mode via the above DMODE utility without having to reinstall the drivers. **Drivers for 1024x768 interlaced and non-interlaced are the same.**

Ver 2.4	Display Mode Setup (DMODE)		07/15/91
—FEATURE—	— OPTION ————	—FEATURE—	— OPTION ————
Monitor 1	Multisync-Analog	Gray Scale	OFF
Monitor 2	None	Memory Size	1024 KB
Adapter	VGA	I/O Bus	16-bit
Mode	38 Format : 1024x768 256 Colors Graphic Mode		
Refresh Rate》	60 Hz (non-interlaced)		
Operation :	Please Press [◄] or [►] key to select Refresh Rate		
[▲▼ ◄►] : Select a FEATURE [SPACE] : Select next OPTION [BK-SP] : Select last OPTION [ENTER] : Execute OPTION		[F1] : Video Information [F2] : Advanced Features [F10] : To mode 3 or last mode [Esc] : Activate OPTION and exit	
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IMPORTANT

1. Please be sure that your monitor is capable of supporting the frequencies required for interlaced or non-interlaced 1024x768 mode. Choosing the mode that your monitor is not capable of displaying will bring unsatisfactory results.

2. The default mode for 1024x768 of your Enhanced VGA Adapter is in interlaced mode. **Interlaced mode will be activated upon power-up or "soft-boot" of your computer.**

SELECTING 70Hz and/or 72Hz Flicker-Free Mode

Your Enhanced VGA Adapter is designed to support 70Hz and/or 72Hz flicker-free display. You can select 70Hz or 72Hz display via DMODE menu (Ver 2.4 or later) or DMODE command syntax explained under "DMODE COMMAND?"

Non-interlaced display can also be set via DMODE menu (Ver 2.4 or later) or DMODE command syntax directly. Please see details on DMODE command syntax by executing "DMODE COMMAND?".

When executing DMODE at DOS prompt, you will see follows on the screen.

Ver 2.4	Display Mode Setup (DMODE)		07/15/91
--FEATURE--	— OPTION ————	—FEATURE—	— OPTION ————
Monitor 1	Multisync-Analog	Gray Scale	OFF
Monitor 2	None	Memory Size	1024 KB
Adapter	VGA	I/O Bus	16-bit
Mode	30 Format : 800x600 256 Colors Graphic Mode		
Refresh Rate》	43.5 Hz (interlaced) [FIXED]		
Operation :	Please Press [◄] or [►] key to select Refresh Rate		
[▲▼ ◄►] : Select a FEATURE [SPACE] : Select next OPTION [BK-SP] : Select last OPTION [ENTER] : Execute OPTION		[F1] : Video Information [F2] : Advanced Features [F10] : To mode 3 or last mode [Esc] : Activate OPTION and exit	
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IMPORTANT

1. Please be sure that your monitor is capable of supporting the frequencies required for Flicker-Free mode.

2. User simply move cursor to select the monitor used, the desired adapter and display mode. Press the **ENTER** key to execute option. Of course, you can also select gray scale, memory size and I/O bus to meet your requirement.

SELECTING 800X600 Interlaced Graphics Mode

Your Enhanced VGA Adapter provides the capability to display 800x600 graphics resolution in interlaced mode for standard VGA monitor. The output frequency is 31.5KHz / Horizontal, 87Hz (43.5Hz x 2) / Vertical. You can select 800x600 in interlaced mode via DMODE utility.

Selecting mode 29h in DMODE menu represents 800x600/ 16 Colors Graphic Mode and mode 30h represents 800x600 /256 Colors Graphics Mode. Both mode 29h and 30h are interlaced modes.

After you have selected mode 29h or 30h, keep moving cursor to "Monitor 1" and press Space key to select "VGA". And then you will see the Refresh Rate is "43.5Hz (interlaced) [FIXED]". After above steps, you will see follows on the screen and may change the screen to the selected mode by pressing **ENTER** key without exit or pressing ESC key to exit DMODE.

Ver 2.4	Display Mode Setup (DMODE)		07/15/91
—FEATURE—	— OPTION ————	—FEATURE—	— OPTION ————
Monitor 1	Multisync-Analog	Gray Scale	OFF
Monitor 2	None	Memory Size	1024 KB
Adapter	VGA	I/O Bus	16-bit
Mode	30 Format : 800x600 256 Colors Graphic Mode		
Refresh Rate》	43.5 Hz (interlaced) [FIXED]		
Operation :	Please Press [◂] or [▸] key to select Refresh Rate		
[▴▾ ◂▸] : Select a FEATURE [SPACE] : Select next OPTION [BK-SP] : Select last OPTION [ENTER] : Execute OPTION		[F1] : Video Information [F2] : Advanced Features [F10] : To mode 3 or last mode [Esc] : Activate OPTION and exit	
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SELECTING 1280X1024 Interlaced Graphics Mode

Your Enhanced VGA Adapter provides the capability to display 1280x1024 graphics resolution in interlaced. The output frequency is 48.5KHz /Horizontal, 87Hz (43.5Hz x 2) / Vertical. You can select 1280x1024 / 16 colors in interlaced mode via DMODE command syntax by typing DMODE 3D and pressing **Enter.**

3-7 Installing The FASTBIOS.SYS Device Driver

The FASTBIOS.SYS device driver is a file located on the Enhanced VGA Utility Diskette that is used to transfer the contents of the video ROM BIOS to PC system RAM. This utility enhances video BIOS operation speed considerably when used in 80286-and 80386-based systems

FASTBIOS.SYS is installed in the system CONFIG.SYS file with the following line

DEVICE=FASTBIOS.SYS

and must be the FIRST of such device driver listed within the CONFIG.SYS file. If this is not done, the follow-ing message may result when loading:

FASTBIOS NOT INSTALLED -- another (earlier installed) device driver has taken over the video interrupt; make sure the line DEVICE=FASTBIOS.SYS occurs first in your CONFIG.SYS file.

Should an attempt be made to install FASTBIOS.SYS in anything other than an 80286- or 80386-based system, the following message will result:

FASTBIOS requires an 80286 or 80386 machine

When FASTBIOS.SYS is successfully installed, the follow-ing message appears:

FASTBIOS Installed

FASTBIOS.SYS, residing within CONFIG.SYS, can only be installed during system boot-up. Please remember to reboot your system after added FASTBIOS to your CONFIG.SYS file, and ensure that FASTBIOS.SYS resides on the same directory as CONFIG.SYS.

Note: If your PC provides shadow RAM, please turn on the shadow RAM instead of using FASTBIOS.SYS device driver. Shadow RAM provides the same high speed BIOS operation as FASTBIOS.SYS without consuming your system capacity.

3-8 Using The Replacement ANSI Standard Console Driver

Format:

DEVICE=EANSI.SYS

This command must be added in the configuration file **(CONFIG.SYS)** to install EANSI.SYS, just as the command to install the ANSI.SYS device driver that comes on the DOS diskette. EANSI.SYS is compatible with the standard ANSI.SYS, and additionally supports the extended screen modes provided by the Enhanced VGA. Once install with the above command, EANSI.SYS also supports all the screen control and keyboard remapping features as ANSI.SYS does.(see your DOS Technical Reference manual). EANSI.SYS is a replacement for ANSI.SYS, and the two should not be used use at the same time.

EANSI.SYS may be used to select the extended screen modes. This is accomplished by issuing an escape sequence with the "set mode" command, just as any standard mode would be selected with the normal ANSI.SYS. For example, screen mode 22 hex would be selected by sending the escape sequency:

(Esc)[=34h

to the screen. (Note that 34 is the decimal equivalent of 22 hexadecimal). To select other modes, simply replace 34 with the number of the mode you wish to select.
The available extended screen modes listed as follows:

Mode	Columns	Rows
34 dec (22 hex)	132	44
35 dec (23 hex)	132	25
36 dec (24 hex)	132	28
42 dec (2A hex)	100	40
38 dec (26 hex)	80	60
2 dec (02 hex)	80	25

For example, to place the screen in 132-column by 44-row mode, do the following. Place the DEVICE command:

```
DEVICE=EANSI.SYS
```

in the CONFIG.SYS file on a bootable disk, and place EANSI.SYS and BASICA.COM on that disk. Boot the system, and in response to the DOS prompt, type **BASICA**, then press **ENTER** and type the following BASIC commands:

```
OPEN "0",1,"TEMP.DAT"
PRINT #1, CHR$(27);"[=34h";
CLOSE
SYSTEM
```

It creates a file TEMP.DAT, containing the escape sequence to select mode 22 hex, 132-column mode. In response to the DOS prompt,

tYPE TEMP.DAT and press **ENTER**

which will send the escape sequence to the screen. The screen is immediately set to 132-column mode. Note that the escape sequence will not be displayed; it is interpreted as a command rather than displayable text.

3-9 Using The Custom Font Loader And Font Editor

The Custom Font Loader and Font Editor included on the Enhanced VGA Utility & Driver Diskette let you instantly change the set of characters (character font) displayed on the screen. For example, letter "A" could be displayed as @ or !!, or could even be changed to a different character entirely. This is very useful for scientific, foreign language application as well as simply customizing the symbles on your screen.

Normally, fonts must be changed from within a program, but the Font Loader lets you change the displayed font with a single DOS command. You can load one of the several ready-made fonts provided on the Enhanced VGA Utility & Driver Diskette, or you can use the font editor to customize your own fonts.

The font Editor and Loader programs are included on the Utility & Driver Diskette. Below are descriptions of the files and their functions.

Note: Fonts may be loaded in text mode only. When a font is selected to be displayed, every character on the screen is immediately displayed with new font.

FEDIT.COM the font editor, used to create new fonts and/or modify existing fonts. Start the Font Editor by typing command "FEDIT" at the DOS prompt. Select the Help option in FEDIT's main menu for more information.

FLOAD.COM the font loader, is used for loading a selected font into video memory from disk. Up to four fonts could be stored simutaneously in video memory. Type the command FLOAD, for more information in use of this program.

Assorted Fonts fonts packaged on your Utility & Driver Diskette are listed here. Any file with FNT extension contains a font.

6X8.FNT a 6 by 8 font used with the 132-column by 44-line mode.

6X14.FNT a 6 by 14 font used with the 132-column by 25 or 28-line modes.

8X8.FNT a 8 by 8 font used with the 80-column by 60-line mode.

8X8THIN.FNT a 8 by 8 font used with the 80-column by 60-line mode.

8X14.FNT a 8 by 14 font used with the 80-column by 25-line mode.

8X14APL.FNT a 8 by 14 font, includes APL symbols used with the 80-column by 25-line mode.

8X14THIN.FNT a 8 by 14 font used with the 80-column by 25-line mode.

3-10 Using The Diagnostic Test Program

Included in the Enhanced VGA Utility & Driver Diskette is a test program called **VDIAG.EXE** which can help you

further verify that your Enhanced VGA and attached display monitor are working properly.

1. At the DOS prompt, type **VDIAG** and prese **ENTER.**

2. The test will start and prompt you with further instructions.

3-11 Driver Installation For Autodesk's AutoCAD 2.5

The following instructions are applicable to users of Autodesk's Inc. AutoCAD Version 2.5 and the Enhanced VGA. Please note that to use the 800x600 or 1024x768 mode of the Enhanced VGA, and ANALOG variable frequency or functional equivalent monitor is required. Choosing a higher resolution then your monitor is capable of displaying will bring unsatisfacory results.

The Enhanced VGA Utility & Driver Diskette contains the AutoCAD ADI driver program named **DSVGA.EXE** which makes full use of the high resolution graphics capabilities of the Enhanced VGA.

Instruction:

1. Copy the driver program **DSVGA.EXE** contained on the Enhanced VGA Utility & Driver Diskette to the disk which has the AutoCAD program files.

2. The Enhanced VGA driver program **DSVGA.EXE** needs to be loaded before you can use the 1024x768, 800x600 and 640x480 modes with AutoCAD. Once loaded, the driver remains memory resident until you power off or restart your system. Remember that you need to load the driver only once each time you power on or restart the system.

   To load the driver program via one line of entry type

   DSVGA -r{12345}-v{nn}

   Where -r selects the desired resolution listed below.

   1 = 640x480 (8x 8) Font, 16 color
   2 = 1024x768 (8x16) Font, 16 color
   3 = 640x480 (8x16) Font, 2 color
   4 = 800x600 (8x16) Font, 16color

```
  5 =  640x480   (8x16) Font, 16 color
```

Where -v selects the interrupt vector for driver used (7A is the default interrupt used by both AutoCAD and this driver).

Example: **DSVGA -r2-v7D**

selects 1024x768 resolution by using interrupt 7D.

Note: DSVGA, and attached parameters may be invoked via a batch file.

DSVGA may also be invoked by using the following method, if invoked in this manner, type

DSVGA

The driver program will display the following:

```
       -- AutoCAD ADI Driver V2.2 --
         VGA Adapter AutoCAD Driver

If you are changing resolutions, please respond with
original INT number.

Enter ADI INT number in HEX (Default =7A)

Please Enter Resolution
  1 =  640x480   (8x 8) Font, 16 color
  2 = 1024x768   (8x16) Font, 16 color
  3 =  640x480   (8x16) Font,  2 color
  4 =  800x600   (8x16) Font, 16 color
  5 =  640x480   (8x16) Font, 16 color
Choice ==>
```

Note: Be sure your monitor is capable of displaying the resolution you select.

The driver is now all set to be used at the resolution you selected. If later you wish to change the driver resolution, just type DSVGA again.

3. Using the AutoCAD documentation configure AutoCAD. Simplified instructions are included below.

   . Type ACAD
   . Select Main Menu item 5 (Configure AutoCAD)
   . Select Configuration Menu item 3 (Configure video display)
   . Select ADI display

. Select the hexadecimal interrupt, this must match your -v parameter selection when loading DSVGA. The default is 7A.
. Continue through the configuration menu.

After you complete the configuration, you can begin using AutoCAD.

3-12 Driver Installation For Autodesk's AutoCAD Release 9/10 And Autoshade

The following instructions are applicable to users of Autodesk Inc.'s AutoCAD Release 9/10, Autoshade and the Enhanced VGA adapter.

The enclosed Enhanced VGA Adapter ADI Driver contains an AutoCAD driver program called **VADI40.EXE** which is configured by a file called **VINST.EXE**. The **VADI40.EXE** program makes full use of the 640x480, 800x600 and 1024x768 graphics mode of the Enhanced VGA Adapter. Your VGA monitor must be capable of displaying these resolutions in order to utilize this driver program. Choosing a higher resolution than your monitor is capable of displaying will bring about unsatisfactory results.

To configure **VADI40.EXE** you must run the **VINST.EXE** program at first. In running this, you must answer several questions about Resolution, Configuration, and Screen Colors by entering a new value or pressing **ENTER** to accept the default value displayed by each question.

After all questions are answered in **VINST.EXE**, the program will display a message declaring the AutoCAD ADI driver successfully modified.

Note that there is an extensive list for determining the colors of the various entities comprising the graphic screen. The setting of these colors requires returing a color code number. The following is a list of color code numbers.

0	Background	4	Cyan
1	Red	5	Blue
2	Yellow	6	Magenta
3	Green	7	White

8-15 intensified versions of codes 0-7.

After setting colors for all of the screen elements, your ADI driver configuration is complete.

At this time, you should run **VADI40.EXE** to load the configured driver before loading AutoCAD. If you wish to change any of the screen element attributes, simply run **VINST.EXE** again to make changes and run **VADI40.EXE** again before loading AutoCAD. **VADI40.EXE** should always be run before loading AutoCAD in order to display in the resolution, and with the screen attributes of your choice.

Running AutoCAD

After the ADI driver has been configured to your requirements and **VADI40.EXE** has been run, AutoCAD can then be loaded.

Using the AutoCAD documentation configure AutoCAD. Simplified instructions are included below.

. Type
  ACAD

. Select Main Menu item 5 (Configure AutoCAD)
. Select Configuration Menu item 3 (Configure video display)
. Select ADI display V4.0
. Select the hexadecimal interrupt, the default is 7A
. Continue through the configuration menu

After you complete the configuration, you can begin using AutoCAD.

AutoCAD is trademark of Autodesk Inc.

3-13 Driver Installation For GEM2.2

The following instructions are applicable to users of GEM Version 2.2 and the Enhanced VGA.

The enclosed GEM driver files require a new **GEMSETUP.TXT** file to be installed in place of that which is on **GEM Device Driver Diskette #1.** The drivers make full use of the extended graphics modes of the Enhanced VGA Adapter. Your VGA monitor must be capable of displaying these resolutions in order to utilize this driver.

Be sure that your VGA monitor can display 800x600 and/or 1024x768-pixel resolution. Choosing a higher resolution than your monitor is capable of displaying will bring about unsatisfactory results.

Before installing GEM, perform the following steps:

1. Make a DISKCOPY of **GEM Device Driver Disk #1.** This copy will be used in place of the original during installation.

   Example: **C:>DISKCOPY A: B:** or
   C:>DISKCOPY A: A:

2. Copy **GEMSETUP.V22** from your Utility & Driver Diskette to the newly-created copy of the GEM Device Driver Disk #1, as **GEMSETUP.TXT.**

   Example: **C:>COPY A:GEMSETUP.V22 B:GEMSETUP.TXT**

   Note that you are copying the GEMSETUP file from your Enhanced VGA Utility & Driver Diskette to your GEM Device Driver Disk #1 while simultaneously renaming it.

   After the GEM Device Driver Disk #1 is copied and prepared with the new GEMSETUP.TXT file, you can proceed with the installation.

Install GEM as per instructions, selecting

VGA Adapter (800x600) 16-Color Mode; VGA 800 or
VGA Adapter (1024x768) 16-Color Mode; VGA 1024

as your video adapter, whichever is appropriate for your hardware configuration.

The program will ask you to insert the Utility & Driver Diskette into drive A and the installation will continue. Complete the GEM installation as instructed.

You can now begin using GEM.

3-14 Driver Installation For GEM3.0 - 3.1

The following instructions are applicable to users of GEM Version 3.0 and 3.1, and the Enhanced VGA Adapter.

The enclosed GEM driver files require a new **GEMSETUP.TXT** file to be installed in place of that which is on **GEM System Master Disk.** The drivers make full use of the extended graphics modes of the Enhanced VGA Adapter. Your VGA monitor must be capable of displaying these resolutions in order to utilize this driver.

Be sure that your VGA monitor can display 800x600 and/or 1024x768-pixel resolution. Choosing a higher resolution than your monitor is capable of displaying will bring about unsatisfacory results.

Before installing GEM, perform the following steps:

1. Make a DISKCOPY of **GEM System Master Disk.** This copy will be used in place of the original during installation.

   Example: C:>DISKCOPY A: B: or
   C:>DISKCOPY A: A:

2. Copy the appropriate setup file, **GEMSETUP.V31** for Version 3.1 or **GEMSETUP.V30** for Version 3.0, from Utility & Driver Diskette to the newly-created copy of the GEM System Master Disk, as **GEMSETUP.TXT.**

   Example: For Version 3.0,
   C:>COPY A:GEMSETUP.V30 B:GEMSETUP.TXT

   For Version 3.1,
   C:>COPY A:GEMSETUP.V31 B:GEMSETUP.TXT

   Note that you are copying the GEMSETUP file from Utility & Driver Diskette to your newly-created GEM System Master Disk while renaming it simultaneously.

After the GEM System Master Disk is copied and prepared with the new GEMSETUP.TXT file, you can proceed with the installation.

The installation of VGA extended mode drivers is a 2-step process.

First, install GEM as per instructions, selecting

IBM 16-Color VGA for PS/2 (640x480) or Compatible

as your video driver. Complete the GEM installation instructions normally. After completed installation, it is a good idea to start GEM to ensure that it operates properly before doing the next step.

Next, assuming that GEM worked properly with the IBM VGA driver loaded, reinsert your **System Master Disk** and run GEMPREP again. This time, choose to change your configuration. You want to change the video adapter part of the configuration in order to load the Enhanced VGA Adapter.

Select from the following:

VGA Adapter (800x600) 16-Color Mode or
VGA Adapter (1024x768) 16-Color Mode

The program will ask you to insert the **GEM DRIVER PACK** diskette. This is Your Utility & Driver Diskette. The driver will load and the program will conclude.

You can now begin using GEM.

3-15 132 Column Text Driver Installatin For Lotus 1-2-3 Release 2, 2.01 And Symphony Release 1.1

REQUIREMENTS

Enhanced VGA
Utility & Driver Diskette
256K of System memory for Lotus 1-2-3 Release 2
384K of System memory for Lotus Symphony Relase 1.1
Lotus 1-2-3 Release 2, 2.01, or Lotus Symphony Release 1.1
A blank formatted diskette (not required for hard disk systems)

INTRODUCTION

This document provides step-by-step instructions for the installation of Enhanced VGA drivers for Lotus 1-2-3 Release 2, 2.01, or Symphony Release 1.1.

Six drivers for Lotus 1-2-3 Release 2, 2.01, and Symphony Release 1.1 are provided on your Utility & Driver Diskette. These drivers support all the text modes of the Enhanced VGA: 80x25, 80x60, 132x25, 132x28, and 132x44. There is one driver dedicated to each of these five modes; each of these drivers, when selected as the active text display for a Lotus product, will automatically cause individual Lotus programs and utilities (1-2-3, Translate, Symphony, Printgraph, etc.) to display in the selected format. For example, if the 132x28 driver has been selected in the installation procedure, as described below, then the spreadsheet will display 132 columns by 28 rows of text when 1-2-3 is run.

There is one more driver provided on the Utility & Driver Diskette. The **"All Color Text Modes"** driver supports all five text display modes of the Enhanced VGA. When this driver is selected, each time you return an individual Lotus program or utility, you are offered the choice of any of the five display modes. It allows you to switch between 80-column and 132-column displays without reconfiguring your Lotus program.

Lotus 1-2-3 and Symphony are trademarks of Lotus Development Corp.

We have provided six drivers to give you complete flexibility in configuring Lotus products to meet your needs. If you always want a 132x28 display, install the 132x28 driver and you will automatically get that display every time you start a program from the Lotus or Access menu. If you want the 80x25 display most of the time for speed and reading ease but want to be able to switch to the 132x44 display quickly to get an overall view of your spreadsheets, install the **"All Color Text Modes"** driver and select the desired display each time you start 1-2-3 or Symphony. We've left you the freedom to pick the drivers that are right for you.

Note: when you are using the **"All Color Text Modes"** driver: whenever you return the Translate utility from the Lotus or Access menu, you should have 80x25 mode

selected. The Translate utility operates differently from the other programs and utilities, and does not after show 132-column displays properly from the **"All Color Text Modes"** driver. Also, the Install utility always comes up in 80-column mode no matter what driver is used.

Because the Enhanced VGA board is fully IBM Enhanced Graphics Adapter (EGA)-compatible, the Enhanced Graphic Adapter drivers should be initially installed, and then the appropriate Enhanced VGA driver, as discussed above, should be installed as the text display. When initially installing the EGA drivers, it is important that the drivers (called IBM Enhanced Graphics in 1-2-3 and Separate in Symphony) be installed.

INSTALLATION INSTRUCTIONS

Before installing the Enhanced VGA text drivers, be sure that you have read GETTING STARTED in the Lotus 1-2-3 or the Lotus Symphony documentation. This documentation assumes that you are familiar with the Insatll program and procedures outlined in the Lotus documentation. The Lotus Install program permits new drivers to be added to the driver library via the **Add New Drivers to Library** option of the **Advanced Options Menu.** Once the Enhanced VGA text drivers are added to the library, you may select them via the Modify Current Driver Set Option of the Advanced Options Menu.

Please note that two separate sets of installation instructions are provided below, one for hard disk installation and one for diskette installation. Select the appropriate one for your particular system and follow the instruction for that set.

HARD DISK SYSTEM INSTALLATION

After copied the files from your Lotus diskettes to your hard disk as instructed in the Lotus documentation, you need to copy the Enhanced VGA drivers from you Utility & Driver Diskette to the subdirectory which contains your Lotus 1-2-3 or Lotus Symphony files. The following steps will copy the drivers to your Lotus 1-2-3 or Lotus Symphony subdirectory. The examples here assume that Lotus 1-2-3 is in the subdirectory named 123 or that Lotus Symphony is in the subdirectory named SYMPH. If you have chosen another subdirectory name, simply substitute that name in the steps below.

1. At the DOS C:> prompt, change to the subdirectory which contains your Lotus files. Select the correct command depending on which Lotus software you have.

   . If installing the drivers into subdirectory 123. Type **CD\123** and press **ENTER.**

   . If installing the drivers into subdirectory SYMPH Type **CD\SYMPH** and press **ENTER.**

2. Insert the Utility & Driver Diskette into drive "A".

3. Type **COPY A:\LOTUS*.DRV** and press **ENTER.** This step will copy the drivers from the Utility & Driver Diskette to your Lotus subdirectory.

4. Perform the First-Time Installation of your Lotus product.

Refer to the Lotus GETTING STARTED documentation for instructions on running the Install program. Select the **First-Time Installation** option form the main menu. The Install program will guide you through the procedure of selecting the drivers you want. Remember that Enhanced VGA supports the IBM Enhanced Graphics format, so you should select the EGA Adapter for the initial text and graphics screen display device. The Install program will also ask questions pertaining to the printer and other devices connected to your system.

When you have completed the driver selection, press the F10 function key to display the current driver selections. Please note that the Text Display and Graph Display selections must match the samples below in order to use the Enhanced VGA text drivers. You may want to create several driver sets, and experiment to see which suits your needs.

When you have completed your selections, the Install program saves the drivers you select in a file, or driver set, called **123.SET** for Lotus 1-2-3 or **LOTUS.SET** for Lotus Symphony. When prompted, respond that you do not want to leave the Install program at this time. Continue with step 5; you are now ready to install the Enhanced VGA text drivers.

When installing Lotus 1-2-3 your selections should look like:

Text Display	IBM Enhanced Graphics
Graph Display	IBM Enhanced Graphics
Keyboard	IBM Keyboard
Printer Int.	IBM Printer Interface
File Trans	IBM PC or compatible
Collating	Numbers first or other choice
Math Unit	Co-processor Floating Point Driver
	Software Floating Point Driver
Text Printer	None or the printer you selected
Graph Printer	None or the printer you selected

When installing Lotus Symphony your selections should look like:

Text Display	Universal Text Display - Separate
Graph Display	IBM Enhanced Graphics - Separate
Keyboard	IBM Keyboard
Printer Int.	IBM Printer Interface
Comm Port	None or the comm port you selected
Modem	None or the modem you selected
Comm Protocol	None or the protocol you selected
File Trans.	**IBM PC or compatible**
Collating	Numbers first or other choice
Math Unit	Co-processor Floating Point Driver
	Software Floating Point Driver
Text Printer	None or the printer you selected
Graph Printer	None or the printer you selected

5. You should be in the Main Menu of the Install program at this point. Select **Advanced Options** from the Install Main Menu and press **ENTER.**

6. The Advanced Options Menu will appear on your screen. Select **Add New Drivers to Library** and press **ENTER.** Note that this step only needs to be performed once.

7. The Install program will ask you to press **RETRUN.** This step creates a file named **SINGLE.LBR** which contains the drivers we are adding.(After completed step 3,you have copied the drivers from the Utility & Driver Diskette to your subdirectory. So you are all set to go.)

8. The Advanced Options Menu will appear on your screen Select **Modify Current Driver Set** and press **ENTER.**

9. The current drivers selected will appear on your screen. Select **Text Display** and press **ENTER.**

10. The text display drivers will appear on your screen. Select the VGA driver you want to use and press **ENTER.** As discussed earlier, the available drivers for VGA are:

    VGA Adapter (All Color Text Modes)
    VGA Adapter (80x25 Color Text Only)
    VGA Adapter (80x60 Color Text Only)
    VGA Adapter (132x25 Color Text Only)
    VGA Adapter (132x28 Color Text Only)
    VGA Adapter (132x44 Color Text Only)

11. The currently selected drivers will appear on your screen. Verify that the VGA driver you selected appears in the Text Display field. Select Return to Menu and press **ENTER.**

12. The Advanced Options Menu will appear on your screen. Select **Save Changes** and press **ENTER.**

13. At this time the Install program prompts you for the name of your driver set. Lotus 1-2-3 and Lotus Symphony permit selection of the driver set to use when you start the program. If you want to name the driver set, type the name and then press **ENTER.** For example, if you selected the VGA Display (132x28) driver, you may wish to name it VGA28. To save the current driver set using the default name of 123 for Lotus 1-2-3 or LOTUS for Lotus Symphony simply press **ENTER.** These default driver sets will be used automatically if you don't explicitly select another driver set when you run Lotus or Access.

14. The Install program will inform you that the driver set has been saved. Press **ENTER.** The Exit Menu will appear on your screen. You can create additional driver sets at any time by selecting the **Advanced Options Menu, Modify Current Driver Set,** and **Save Changes** procedures of the Install program (steps 8 through 13 above). If you want to create additional driver sets now, press ENTER to go to the Main Menu. Don't forget to use a different name for each driver you save. When you have finished above, select "Yes" and press ENTER to exit the Install program.

15. Refer to the Starting and Ending chapter of the Lotus "Getting Started" documentation to learn how to start Lotus 1-2-3 or Lotus Symphony. Below are some examples of how to select a different driver set when starting the program. Depending on your particular installation you may need to have the Lotus System Disk in drive "A".

If you are starting Lotus 1-2-3:

Type LOTUS and press **ENTER** to use the default driver set named 123.

Type **LOTUS VGA28** and press **ENTER**, where **VGA28** is the name of the driver set you created used for 132 column by 28 row display on your Enhanced VGA board.

NOTE

The VGA mode selection pop-up menu is available when the VGA Card (All Color Text Modes) driver has been selected. It is activated by pressing the Ctrl and A keys simultaneously. Select the desired mode by moving the cursor until the mode you want is highlighted. Press ENTER or. This will cause the system to beep indicating that your choice has been accepted. You must then exit to DOS or the LOTUS (or SYMPHONY) ACCESS menu depending on how you entered the program and where you made the mode selection. Modes can be selected in the ACCESS menu or the 1-2-3 screen. EXITing or QUITing from ACCESS or 1-2-3 will put your mode selection in effect as you reenter the program. Your last mode selection will be the mode which starts the program next time.

If you are starting Lotus Symphony:

Type **ACCESS** and press **ENTER** to use the default driver set named **LOTUS.**

Type **ACCESS VGA28** and press **ENTER**, where **VGA28** is the name of the driver set you created used for 132 column by 28 row display on your Enhanced VGA board.

See the NOTE above.

DISKETTE SYSTEM INSTALLATION

Before you begin, be sure that you have made backup diskette copies of the Lotus 1-2-3 or Lotus Symphony diskette as instructed in the Lotus documentation. You also need a blank formatted diskette to hold any driver sets you make and label this diskette "Lotus driver Sets". The following steps will read the Enhanced VGA text drivers and create a file named SINGLE.LBR on your backup Utility Disk.

1. Perform the First-Time Installation of your Lotus product. Refer to the Lotus GETTING STARTED documentation for instructions on running the Install program. The Install program is found on your backup Utility Disk. Select the **First-Time Installation** option from the main menu. The Install program will guide you through the procedure of selecting the drivers you want. Remember that the Enhanced VGA supports the IBM Enhanced Graphics Format, so you should select the EGA Adapter for the initial text and graphics screen display device. The Install program will also ask questions pertaining to the printer and other devices connected to your system.

   When you have completed the driver selection, press the **F10** function key to display the current driver selections. Please note that the Text Display and Graph Display selections must match the samples below in order to use the Enhanced VGA text drivers. You may want to create several driver sets, save them on your Lotus Driver Sets Disk and experiment to see which suit your needs.

   When you have completed your selections the Install program saves the drivers you select in a file, or driver set, called **123.SET** for Lotus 1-2-3 or **LOTUS.SET** for Lotus Symphony. When prompted, respond that you do not want to leave the Install porgram at the time. Continue with Step 2; you are now ready to install the Enhanced VGA text drivers.

When installing Louts 1-2-3 your selections should look like:

Text Display	IBM Enhanced Graphics
Graph Display	IBM Enhanced Grpahics
Keyboard	IBM Keyboard
Printer Int.	IBM Printer Interface
File Trans.	IBM PC or compatible
Collating	Numbers first or other choice
Math Unit	Co-processor Floating Point Driver
	Software Floating Point Driver
Text Printer	None or the printer you selected
Graph Printer	None or the printer you selected

When installing Lotus Symphony your selections should look like:

Text Display	Universal Text Display - Separate
Graph Display	IBM Enhanced Graphics - Separate
Keyboard	IBM Keyboard
Printer Int.	IBM Printer Interface
Comm Port	None or the comm port you selected
Modem	None or the modem you selected
Comm Protocol	None or the protocol you selected
File Trans.	IBM PC or compatible
Collating	Numbers first or other choice
Math Unit	Co-processor Floating Point Driver
	Software Floating Point Driver
Text Printer	None or the printer you selected
Graph Printer	None or the printer you selected

2. You should be in the Main Menu of the Install program at this point. Select **Advanced Options** from the Install Main Menu and press **ENTER.**

3. The Advanced Options Menu will appear on your screen. Select **Add New Drivers to Library** and press **ENTER.**

4. The Install program will ask you to insert the diskette containing the drivers into drive "A". Insert the Utility & Driver Diskette into drive "A" and press **ENTER.**

5. The Install program will ask you to insert the backup Utility Disk into drive "A" and press **ENTER.** A file named **SINGLE.LBR** containing the VGA drivers will be created on the backup Utility Disk. The Install program will inform you that the new drivers are now installed; press **ENTER.**

6. The Advanced Options Menu will appear on your screen. Select **Modify Current Driver Set** and press **ENTER.**

7. The current drivers selected will appear on your screen. Select **Text Display** and press **ENTER.**

8. The text display drivers will appear on your screen. Select the VGA driver you want to use and press **ENTER.** As discussed earlier, the available drivers for VGA are:

   VGA Adapter (All Color Text Modes)
   VGA Adapter (80x25 Color Text Only)
   VGA Adapter (80x60 Color Text Only)
   VGA Adapter (132x25 Color Text Only)
   VGA Adapter (132x28 Color Text Only)
   VGA Adapter (132x44 Color Text Only)

9. The currently selected drivers will appear on your screen. Select **Return to Menu** and press **ENTER.**

10. The Advanced Options Menu will appear on your screen Select **Save Changes** and press **ENTER.**

11. At this time the Install program prompts you for the name of your driver set. Lotus 1-2-3 and Louts Symphony permit selection of the driver set to use when you start the program. If you want to name the driver set, type the name and then press **ENTER.** For example, if you selected the VGA Display (132*28) driver you may wish to name it VGA28. You will not have enough space for all your driver sets on the Lotus System Disk. When the Install program asks you for the system disk, be sure to insert the Lotus Driver Sets Disk.

12. The Install program will inform you that the driver set has been saved, press ESCAPE two times. The Main Menu will appear on your screen. You can create additional driver sets at any time by selecting the **Advanced Options Menu, Modify Current Driver Set,** and **Save Changes** procedures of the Install program (steps 6 through 11 above). If you want to create additional driver set now, press **ENTER** to go to the Main Menu. Don't forget to use a different name for each driver you save. When you have finished above, select **"Yes"** and press **ENTER** to exit the Install program.

13. Refer to the Starting and Ending chapter of the Lotus Getting Started documentation to learn how to start Lotus 1-2-3 or Lotus Symphony. Place the Lotus Driver Sets Disk into drive "B". Below are some examples of how to select a different driver set when starting the program.

If you are starting Lotus 1-2-3:

Type **LOTUS** and press **ENTER** to use the default driver set named **123**.

Type **LOTUS B:VGA28** and press **ENTER**, where **VGA28** is the name of the driver set you created used for 132 column by 28 row display on your Enhanced VGA board.

Type **LOTUS B:VGA44** and press **ENTER**, where **VGA44** is the name of the driver set you created used for 132 column by 44 row display on your Enhanced VGA board.

NOTE

The VGA mode selection pop-up menu is available when the VGA Card (**All Color Text Modes**) driver has been selected. It is activated by pressing the **Ctrl** and **A** keys simultaneously. Select the desired mode by moving the cursor until the mode you want is highlighted. Press **ENTER**. This will cause the system to beep indicating that your choice has been accepted. You must then exit to DOS or the LOTUS (or SYMPHONY) ACCESS menu depending on how you entered the program and where you made the mode selection. Modes can be selected in the ACCESS menu or the 1-2-3 screen. EXITing or QUITing from ACCESS or 1-2-3 will put your mode selection in effect as you reenter the program. Your last mode selection will be the mode in which the program next starts.

If you are starting Lotus Symphony:

Type **ACCESS** and press **ENTER** to use the default driver set named **LOTUS**.

Type **ACCESS B:VGA28** and press **ENTER**, where **VGA28** is the name of the driver set you created used for 132 column by 28 row display on your Enhanced VGA board.

Type **ACCESS B:VGA44** and press **ENTER**, where **VGA44** is the name of the driver set you created used for 132

column by 44 row display on your Enhanced VGA board.

See the NOTE above.

3-16 Driver Installation For Ventura Publisher Version 1.1 - 2.0

The following instructions are applicable to users of Ventura Publisher Version 1.1 - 2.0 and the Enhanced VGA Adapter.

The enclosed Ventura 800x600 and 1024x768 driver files are installed AFTER Ventura Publisher has been installed on your system. The drivers make full use of the 800x600 or 1024x768 graphics modes of Enhanced VGA Adapter. Your VGA monitor must be capable of displaying this resolution in order to utilize this driver.

Be sure that your VGA monitor can display 800x600 and/or 1024x768-pixel resolution. Choosing a higher resolution than your monitor is capable of displaying will bring about unsatisfactory results.

To install your VGA driver, perform the following steps:

1. Follow the Ventura installation instructions.

2. When you are asked to select a video adapter, choose

   E IBM Personal System/2 (640x480) two colors (Version 1.1)
   or
   E IBM VGA or Compatible (640x480) 2 colors (Version 2.0)

3. Complete Ventura Publisher installation and see that it is working properly by using the installed IBM driver.

4. Exit Ventura Publisher and insert the Enhanced VGA Utility & Driver Diskette in your A: drive.

5. Log on to your A: drive, for example:

   C:>A: [ENTER]
   A:>

   and type **VPDRV2_0** [ENTER].

6. The program will ask you some questions about your Ventura configuration. Answer them appropriately.

7. When the program asks you what display device and resolution you want to install for, make a selection

   VGA Adapter (800x600) 16 colors or greys. or
   VGA Adapter (1024x768) 16 colors or greys.

   whichever is appropriate or desirable for your hardware configuration.

8. The program then asks for the type of mouse you have. Respond (appropriately) as you did during your initial installation.

9. Finally, the program displays the choices you have made and provides you the opportunity to change. If no change is needed, press **[ENTER]** or **"Y"** (the default response is **"Y"**) and the driver will be installed.

10. If you desire a change, press **"N" [ENTER]** and make your changes.

The driver will then be installed and you can log back on to the hard disk drive and begin using Ventura.

3-17 Drivers Installation For Microsoft Windows 2.xx And Windows/386 Version 2.1

The following instructions are applicable to users of Microsoft Windows version 2.XX and Windows/386 Version 2.1. Note that, to use the 1024x768 or 800x600 modes, a variable frequency ANALOG color display capable of 1024x768 resolution is required.

Driver installation for Windows version 2.xx

The Utility & Driver Diskette contains new driver program, which replaces the driver files contained on the Windows Screen Driver Diskette. The drivers supplied make full use of the Enhanced VGA and 800x600 graphics modes.

Instructions:

1. Run the Windows **SETUP** program as usual, when the choose the display adapter menu is displayed, select **"Other Display Driver Supplied by Manufacturer "** option.

2. When prompted by Windows , insert Enhanced VGA Diskette 1
   into drive "A:". Windows will locate the supplied dirver. Select either

   VGA/16 Adapter 800x600 color mode.
   VGA/16 Adapter 1024x768 color mode.

3. When prompted by Windows, select **"VGA Fonts"**.

4. Continue with the rest of the Windows setup process.

After you complete the above steps you can begin using Windows.

Driver installation for Windows/386 version 2.1

The Utility & Driver Diskette contains the high-resolution drivers as well as a file called **SETUP.INF** to replace the files of the same name on the Windows/386 Setup, Build, and Display 1 diskette. Follow the instructions listed below carefully to install a high-resolution driver.

Instructions:

1. Make a DISKCOPY of the Setup, Build, and Display 1 diskette. Example (for systems with one diskette drive and hard drive):

   C:>DISKCOPY A: A:

The system will use drive A: for both the original and the copy as the source and target diskettes are inserted alternately for the copy.

2. After the copy is made, return the original to its jacket and store safely.

3. Copy the file **SETUP.INF** from Utility & Driver Diskette to the newly-created copy of the Setup, Build, and Display 1 diskette. Example (for systems with a single floppy and hard drive):

   C:>COPY A:SETUP.INF B:

   The system will use drive A: as drive B: also. After the copy is finished, type A: **[ENTER]**.

4. The **SETUP [ENTER]** to begin installation of Windows/386.

5. When asked if the configuration list is correct, move the cursor to the **VGA** selection and press **[ENTER]** to select from the following:

   VGA Adapter 800x600 Mode
   VGA Adapter 1024x768 Mode

6. The program will ask you to insert the VGA Driver Diskette 1 in order to install the driver information. Please insert your Utility & Driver Diskette in drive A: and type **A:\DRIVER\WIN386 [ENTER]**. After this is done, the installation program will continue normally.

3-18 Driver Installation For Microsoft Windows 3.0 and 3.0a

The following instructions are applicable to users of Microsoft Windows and the Enhanced VGA Adapter. Note that, to use 800x600, 1024x768 and 1280x1024 modes, an ANALOG color display capable of these high resolutions is required.

The "Enhanced VGA - Windows 3.0 Driver" diskette contains 256 color (32K/64K colors is optional) and high-resolution drivers as well as a file called **SETUP.W30** (for Windows 3.0) or **SETUP.W3A** (for Windows 3.0a) to replace the file called **SETUP.INF** on the Microsoft Windows Setup "DISK 1 " diskette. Follow the instructions listed below carefully to install the drivers.

Instructions:

1. Make a DISKCOPY of the Setup "Disk 1" diskette. Example (for systems with a single floppy and hard drive):

C:>DISKCOPY A: A:

The system will use drive A: for both the original and the copy as the source and target diskettes are inserted alternately for the copy.

2. After the copy is made, return the original to its jacket and store safely.

3. Copy the **SETUP** file from the "Enhanced VGA - Windows 3.0 Driver" diskette to the newly-created copy of the Setup "Disk 1" diskette. Example (for systems with a single floppy and hard drive):

   For Windows 3.0:
   C:>COPY A:SETUP.W30 B:SETUP.INF

   For Windows 3.0a:
   C:>COPY A:SETUP.W3A B:SETUP.INF

   The system will use drive A: as drive B: also. After the copy is finished, type **A: [ENTER]**.

4. Type **SETUP [ENTER]** to begin installation of Windows.

5. Review the configuration list when it is shown. If you wish to change display type, move the cursor (highlighted line) to the **"Display:"** line and press **[ENTER]** to select from the available list.

6. The program will ask you to insert the "Enhanced VGA - Windows 3.0 Driver" diskette in order to install the drivers as required. After this is done, the installation program will continue normally.

After you complete the above steps, you can begin using Windows.

Note: If you wish to change the display type after completing the installation, click on the Windows Setup icon found in the Main desktop window.

3-19 Driver Installation For Microsoft Windows 3.1

The following instructions are applicable to users of Microsoft Windows 3.1 and the Enhanced VGA Adapter.

INSTRUCTIONS -- WINDOWS 3.1 DRIVER INSTALLATION

On the "Enhanced VGA - Windows 3.0 Driver" diskette,

RENAME the file **OEMSETUP.W31** to **OEMSETUP.INF**

Run the Windows Setup program and choose "Other (Requires disk provided by hardware manufacturer)" for the Display selection. When requested by the Setup program insert the "Enhanced VGA - Windows 3.0 Driver" diskette. Follow the instructions provided by the Setup program.

As you use the Windows Setup program, Windows may prompt you for some of the Windows Installation diskettes. The Enhanced VGA - Windows drivers use display fonts which are contained on the standard Windows distribution diskettes.

The enclosed drivers are generic and should work with the Enhanced VGA card. The drivers have various display memory requirements and of course your display monitor must be able to support the resolution you select.

The drivers support the following:

Resolution	Mode (HEX)		Minimum display memory required	Driver name		Windows Font
640x480x2	11h		256 KB	VGAMONO.DRV	**	VGA
640x480x16	12h		256 KB	VGA.DRV	**	VGA
800x600x16	29h		256 KB	VGA464.DRV		8514
800x600x16	29h		256 KB	VGA464S.DRV		VGA
1024x768x16	37h		512 KB	VGA474.DRV		8514
1280x1024x16	3Dh		1 MB	VGA414.DRV		8514
640x480x256	2Eh		512 KB	VGA448.DRV		VGA
640x480x32K	2Eh	xx	1 MB	VGA443.DRV		VGA
640x480x64K	2Eh	xx	1 MB	VGA446.DRV		VGA
800x600x256	30h		512 KB	VGA468.DRV		8514
800x600x256	30h		512 KB	VGA468S.DRV		VGA
800x600x32K	30h	xx	1 MB	VGA463.DRV		8514
800x600x32K	30h	xx	1 MB	VGA463S.DRV		VGA
800x600x64K	30h	xx	1 MB	VGA466.DRV		8514
800x600x64K	30h	xx	1 MB	VGA466S.DRV		VGA
1024x768x256	38h		1 MB	VGA478.DRV		8514

** uses Windows 3.1 supplied VGA driver
xx requires a Sierra Semiconductor or compatible HICOLOR DAC (option)

IMPORTANT

It is important that the drivers be installed properly, replacement grabbers (GR2 extension) and Virtual-Display Device handler (386 extension) are included to properly support the extended feature set of the Enhanced VGA card.

3-20 Driver Installation For WordStar Release 4.0 132-Column Text Modes

The 132-column modes for WordStar Release 3.3 are set through the **WSCHANGE.EXE** file. A 132-column mode also needs to be set on the Enhanced VGA adapter prior to loading a reconfigured WordStar file for 132-column capability. Follow the instructions carefully to ensure that your new version is completed correctly and no damage results to your original files.

1. Make a copy of your **WS.EXE** file, renaming it to indicate that the new copy will be the 132-column version.

   EXAMPLE: **C:>COPY WS.EXE WS132.EXE**

   This provides you with separate WordStar files: one for normal 80-column operation, and one for 132-column operation.

2. Load the WSCHANGE file.

3. Type the filename to install as WS132.

4. Type the filename to save any changes to as WS132.

5. Choose "A Console" from the Main Installation Menu.

6. Choose "A Monitor" from the Console menu.

7. Choose "C Screen sizing" from the Monitor menu.

8. Specify the Height and Width measurements that suit your needs best(i.e., 25 and 132) and exit the menu.

9. Exit through the remainder of the menus and WSCHANGE.

You are now finished making a 132-column version of WordStar. The next step is to put the Enhanced VGA into the proper 132-column mode prior to loading WS132. The easist way is to be accomplished with a batch file as follows.

1. Use EDLIN or any text editor capable of saving files in ASCII form to create a file. Choose a name other than WS or WS132 since these names already belong to WS.EXE and **WS132.EXE.** For illustrative purposes, we will use WORDSTAR.BAT. You can also create this file using DOS command, **COPY CON (e.g.: WORDSTAR.BAT).**

2. Your batch file only needs three lines:

   DMODE 23
   WS132
   DMODE VGA

3. Type **WORDSTAR** at the DOS prompt and the batch file will first change the mode and then load WS132. Upon exiting WS132, it will revert to a standard 80x25 mode.

These instructions may be used, generally, to provide similar 132-column modes for WordStar Professional.

3-21 Driver Installation For WordPerfect 5.0-5.1 132-Column Text Modes

The 132-column modes for WordPerfect Version 5.0 and Version 5.1 are set simply by starting the program with a switch appended to the startup filename, WP. This switch, /SS, is used to define ROWS and COLUMNS on startup. The program, however, will only assign the rows and columns according to what the screen will hold. Therefore, the screen mode must be set prior to running WordPerfect by using the WP/SS file. It will be easier to be accomplished by using a batch file from DOS to set the mode, start the program, and reset the mode on exit.

1. Use EDLIN or any text editor capable of saving files in ASCII form to create the bacth file. Choose a name other than WP as that already belongs to the WordPerfect program. For illustrative purposes, we will use **WORDPERF.BAT.** You can also create this file using DOS command,**COPY CON** (e.g.:WORDPERF.BAT).

2. Your batch file only needs three lines:
   DMODE 23
   WP/25132
   DMODE VGA

3. Type **WORDPERF** at the DOS prompt and the batch file will first change the mode and then load WordPerfect using the rows/columns switch. Note the order in which the switch is written: ROWSCOLUMNS. Use any of the three 132-column modes, 132x25, 132x28, or 132x44, but be sure to type row numbers before column numbers in the WP switch and make the WP switch match the mode that you set on your Enhanced VGA.

3-22 Driver Installation For WordPerfect 5.0-5.1

The following instructions are applicable to users of WordPerfect 5.0 and 5.1 at 800x600 or 1024x768 resolution.

The enclosed drivers, WP800.WPD, WP1024.WPD, and WP51ET4.VRS are used to enable WordPerfect to be displayed at 800x600 and 1024x768 resolution, respectively. The drivers need only to be copied onto the disk directory where WordPerfect resides. Upon loading the program the following steps should be taken to choose the resolution desired:

1. From the document screen displayed after entered WordPerfect, press **SHIFT/F1** to get to the Setup menu.

2. From Setup, choose option 3 (V.5.0) or 2 (V.5.1) - Display. This brings up the Get Setup: Display menu.

3. From the Get Setup: Display menu, choose option 5 (V.5.0) or 2 (V.5.1) - Graphics Screen Type.

4. From the Get Setup: Graphics Screen Type menu, choose either

VGA Adapter 800x600 16 color
or
VGA Adapter 1024x768 16 color

or the Extended VGA option which lets you choose from

VGA 1024x768 16 color
VGA 1024x768 256 color
VGA 800x600 16 color
VGA 800x600 256 color
VGA 640x480 16 color
VGA 640x480 256 color

Note: Only select drivers that your adapter supports.

5. Exit from the menus and begin using WordPerfect.

3-23 8514/A Emulation Driver

The following instructions explain how to install the appropriate 8514/A emulation driver for your needs. These emulation drivers are generic and should work on most Enhanced VGA boards. On the Utility & Driver Diskette under **8514AI** sub-directory, you should find these files:

RIXAI4.EXE
RIXAI8.EXE
STAN0715.FNT
STAN0814.FNT
STAN1220.FNT
README.DOC

Two emulators are provided. Choose either emulator depending on your video memory configuration and number of colors desired. The following table illustrates the resolutions available by driver name according to the video memory configuration on your board.

RESOLUTION/COLORS		MODE(hex)	MINIMUM DISPLAY MEMORY REQUIRED	DRIVER
640x480	16	12	512KB	RIXAI4
1024x768	16	37	512KB	RIXAI4
640x480	256	2E	512KB	RIXAI8
1024x768	256	38	1MB	RIXAI8

INSTALLATION

1. Create a subdirectory on the hard disk called RIXAI or another name you want.

2. Copy the contents of the floppy diskette to the newly-created subdirectory.

Decide which version of the emulator is needed based on the amount of video memory on your video adapter and the number of colors you wish to proceed.

4. Type **RIXAIx** at the DOS prompt, where x is either 4 or 8.

5. You can now run your application software under 8514/A emulation.

Remember to load the appropriate emulation driver before running application software that requires 8514/A. You might want to create a simple batch file that loads the emulation driver and your software automatically to simplify the process.

EXAMPLE (acadai.bat)

RIXAI8
ACAD

You may need to reconfigure some software to run under an 8514/A driver. Check the user manuals of your applications to determine if such a driver is supported.

3-24 Driver Installation For OrCAD V3.XX

The following instruction are applicable to users of Orcad V3.XX at 640x480 or 800x600 resolution.

The driver supports the followings:

Resolution	Mode (Hex.)	Minimun display memory required	Driver Name
640x480x16	12h	256KB	TSENG6x4.DRV
800x600x16	29h	256KB	TSENG8x6.DRV

We suggest you to install your ORCAD under the sub-directory named ORCAD in Driver C: and put all the

drivers into another sub-directory named DRIVER under ORCAD, for example:

C:\ORCAD\DRIVER

Instruction

1. Copy files TSENG8x6.DRV (800x600) and TSENG6x4.DRV (640x480) from Utility & Driver Diskette under DRIVER sub-directory as follows:

   C:CD\ORCAD <ENTER>

   C:\ORCAD>COPY A:\DRIVER\ORCAD3*.DRV C:\DRIVER <ENTER>

2. Change working parameter of ORCAD. First please type: DRAFT/C as following:

C:\ORCAD>DRAFT/C <ENTER>

   Then make a proper selection among those choices shown on screen for a correct display driver.

   COMMAND? DD (DD for Display Driver)
   SELECTION -> S (S for Special Driver)
   SELECTION -> TSENG8x6.DRV (or TSENG6x4.DRV)

after completed above, select Q(quit back to MAIN MENU in order to continue next procedure.)

3. If there is no other parameter to be changed,please do remember to select U (update) to substitute for old data in working parameter before executing of ORCAD (R run ORCAD program)or back to DOS prompt (Q quit from ORCAD)

3-25 Driver Installation For PCAD

The following instructions are applicable to users of PCAD at 800x600 resolution.

Instrution:

1. Since PCAD does not support Tseng Labs ET-4000 in 800x600 resolution , you may select any one of display driver among all in the begining when installing PCAD in Hard Disk.

For example, if you choose:

7 - IBM Video Graphics Array (VGA) DIBMVGA.DRV

There will be a DIBMVGA.DRV file in sub-directory

C:\PCAD\DRV

2. And then copy PP800.DRV provided in attached Utility & Driver diskette into sub-directory C:\PCAD\DRV. For example:

   C:>COPY A:\DRIVER\PCAD\PP800.DRV
   C:\PCAD\DRV\PP800.DRV

3. Change the contents of text file - PCADDRV.SYS in root directory as follows:

   replace DISPLAY C:\PCAD\DRV\DIBMVGA.DRV with
   DISPLAY C:\PCAD\DRV\PP800.DRV

3-26 VESA Super VGA BIOS Extension Driver

TLIVESA.COM is the VESA Super VGA BIOS Extension driver for Ehanced VGA Adapter based on Tseng Labs ET4000 chips. The driver implements Version 1.1 of the VESA specification and is a terminate-and-stay-resident (TSR) program which intercepts the video BIOS interrupt vector to provide additional BIOS commands supporting super-VGA modes.

To load, type the command:

TLIVESA [ENTER]

at the DOS prompt. TLIVESA may be loaded through a batch file for convenience. After loading the driver, any VESA application can be run.

The prompt can also be unloaded, freeing up memory, provided no other resident program which intercepts the video BIOS interrupt vector is loaded afterward. (Actually,no resident program at all should be loaded afterward in order to really free the memory.)

To unload,type the command:

TLIVESA U [ENTER]

Unloading TLIVESA may also be performed through a batch file

Enhanced VGA Adapter supports the following VESA BIOS Extension:

Graphics Modes:	100h: 640 x 400	256 Colors
	101h: 640 x 480	256 Colors
	102h: 800 x 600	16 Colors
	103h: 800 x 600	256 Colors
	104h: 1024 x 768	16 Colors
	105h: 1024 x 768	256 Colors
Text Modes :	108h: 80 column x 60 row	
	109h: 132 column x 25 row	

3-27 Driver Installation For WordStar 5.5, 6.0, and 2000

WordStar's Advanced Page Preview requires an external driver to realize graphic displays in resolutions of 800x600 and/or 1024x768 (choose an appropriate resolution for your monitor and video adapter configuration). The WordStar files PREVIEW.OVR and PREVIEW.MSG, as well as TLIVGA6.WGD and TLIVGA7.WGD need to be copied to the WordStar directory from your Driver Diskette. The following versions of WordStar are compatible with the Advanced Page Preview:

WordStar 5.5
WordStar 6.0a - 6.0d
WordStar 2000

Users of WordStar 5.5 through 6.0c, and WordStar 2000 3.5a-3.5c should replace the PREVIEW files with those provided on the driver diskette. The revision number can be determined by looking at the first line of the flash screen.

Invoking the High-resolution Driver

You must specify the driver name within the FONTID.CTL file so that it can be found by the program. Edit the FONTID.CTL (a non-document ASCII file) and change the CRT_TYPE line to read:

```
CRT_TYPE=TLIVGAx.WGD
```

where x is either 6 or 7 for 800x600 or 1024x768 resolution, respectively.

3-28 Driver Installation For Autodesk's AutoCAD 386 Release 10/11

The following instructions are applicable to users of Autodesk Inc.'s AutoCAD 386 Release 10/11 and the Enhanced VGA Adapter.

Instruction

Insert the AutoCAD R10/11 Driver Diskette into floppy A and type A: INSTALL . Then you will be asked several questions about installation. Use the UP and DOWN cursor keys to select the answers which you would like. Press the ENTER key when you have selected an answer.

Example : If you install your AutoCAD under the subdirectory named ACAD in Driver C: and install the driver of AutoCAD 386 Release 11.

C: A:INSTALL <ENTER>

There are some questions will be shown in display as follows

1. Is this a new installation or an update ? Select "NEW" and <ENTER>

2. Select the driver where you want to install the Nth Lite software ? Select "Driver C:" and <ENTER>
3. Specify a directory name for the Nth Lite software .By default, the name of this directory is \NTHLITE . Just press <ENTER>
4. What release of AutoCAD 386 are you using ? Select "AutoCAD 386 Release 11" and <ENTER>
5. Where is AutoCAD installed ? Select " Drive C: " and <ENTER>
6. Specify the name of the directory where AutoCAD 386 is installed.By default, the name of this directory is: \ACAD .Just press <ENTER>

After completed above answers, the following message will be shown :

" Software installation will now begin. "

Just wait for a moment you can begin using AutoCAD.

3-29 BMODE.EXE For Software Mode Switching

Your Enhanced VGA Adapter is designed to provide compatibility with following modes: VGA, EGA, CGA, MDA and Hercules mode.
BMODE.EXE is the utility program which is used to switch display modes after the PC is turned-on. Because your Enhanced VGA Adapter supports various types of monitor, various display standards and 70Hz and/or 72Hz flicker-free mode, you have to properly set the card into the specific mode desired via BMODE. BMODE is an easy-to-use, menu-driven program. When executing BMODE at DOS prompt, type BMODE and press ENTER.

3-30 Hi-Color Driver Installation For Autodesk AutoShade 2.0 and 3D Studio (Option)

The following instructions are applicable to users of Autodesk AutoShade 2.0/3D Studio and the Enhanced VGA Adapter.

Installation instructions:

To install:

1. INSTALLING SOFTWARE: Type A:INSTALL
   Follow the prompts, you will be asked where you would like to install the Nth Render software.

2. CONFIGURING FOR YOUR Enhanced VGA:
   Using the CONFIGUR program, select the appropriate video mode and rendering mode for your graphics adapter.

3. You may need to edit the sample batch files, **NTHSHADE.BAT** and **NTH3DS.BAT**, to contain the correct path for their enviroment variable settings.

AutoShade configuration

1. Run the NTHSHADE.BAT batch file.

2. Reconfigure Autoshade by typing: SHADE -R

3. Choose Option 2, P386 Autodesk Device Interface Driver, when prompted for the display device and the rendering device. Answer yes for all remaining questions regarding screen configuration.

Running AutoShade with the Nth Render driver.

1. Run the NTHSHADE batch file.
2. Change to your AutoShade 2.0 directory and type SHADE to load AutoShade

3D Studio configuration:

1. Change the following 3 lines in the 3DS.SET file (the 3DS.SET file is located in your 3DS directory).

   change line 123 to read:
   DEFAULT-DISPLAY = "RCPADI"

   change line 138 to read:
   MAIN-DISPLAY = RCPADI

   change line 145 to read:
   MATERIAL-DISPLAY = RCPADI

   Running 3D Studio with the Nth Render driver.

   1. Run the NTH3DS.BAT batch file.
   2. Change to your 3D STUDIO directory and type 3DS to start 3D Studio.

CHAPTER 4

ADVANCED INFORMATIONS

4-1 Enhanced VGA APPLICATION NOTE: USING 132-, 100-, AND 80-COLUMN TEXT MODES

SUMMARY

This application note describes how to select the Enhanced VGA Adapter's 132-column text modes from application programs and how the 132-column text modes memory map is organized.

SELECTING 132-, 100-, AND 80-COLUMN COLOR TEXT MODES

The Enhanced VGA Adapter BIOS supports following additional text modes which IBM VGA doesn't support. The numbers those with hex mark are in decimal except .

Mode	Columns	Rows	Length of Memory Map
22 hex	132	44	132x44x2=11616=2D60 hex
23 hex	132	25	132x25x2=6600=19C8 hex
24 hex	132	28	132x28x2=7392=1CE0 hex
2A hex	100	40	100x40x2=8000=1F40 hex
26 hex	80	60	80x60x2=9600=2580 hex

The 132-column modes are selected exactly as the standard modes 0-7 and D-13 are selected:

* Place a 0 in register AH to indicated "select mode" function.

* Place the mode number in register AL.

* Execute an INT 10h instruction, generating software interrupt 10 hex, which invokes the Enhanced VGA BIOS to set the mode.

The above calling sequence should be familiar to anyone who has ever called the BIOS from assembly language or from a machine-language driver, and be the standard BIOS interface for video mode select.

132-, 100-, AND 80-COLUMN COLOR TEXT MEMORY MAP

The 132-, 100-, and 80-column color text memory map begins at B800:0000 just like other text modes. Memory is organized with even bytes as character codes and odd bytes as attributes, like normal text also The row offset register (CRTC register 13 hex) is

normally set to 66 (42 hex) to compensate for the greater width of the screen so the start of each row is 264 bytes after the start of the row above it, as opposed to the 80-column row offset register of 40(28 hex) and 160 bytes from the start of one row to the start of the next.

As indicated in the table above, the lengths of the 132-, 100-, and 80-column memory maps are longer than the normal 80x25 length of 4000 bytes.

4-2 Programming Interface

The functions that are supported as program calls to the adapter are listed in this section. These calls are made through software interrupt 10H (INT 10H).

Funtions are identified by the content of the AH register at the time of the call; in some cases, the AH register identifies a group of similar functions and the AL register identifies the specific function. The primary functions are:

Interrupt 10H functions

(AH)	Function
00H	Mode set
01H	Set cursor type
02H	Set cursor position
03H	Read cursor position
04H	Read light pen position (not supported)
05H	Select active display page
06H	Scroll active page up
07H	Scroll active page down
08H	Read character at current cursor position
09H	Write character(s) at current cursor position
0AH	Write character(s) only at current cursor position
0BH	Set color palette
0CH	Write dot
0DH	Read dot
0EH	Write teletypewriter to active page
0FH	Return current video state
10H	Set palette registers
11H	Character generator routine
12H	Alternate select
13H	Write string
1AH	Display combination code
1BH	Return functionality/state information
1CH	Save/restore
14H	Reserved
15H	Reserved
16H	Reserved
17H	Reserved
18H	Reserved
19H	Reserved

BIOS FUNCTION CALLS

All values in hexadecimal unless otherwise noted.

AH=0 Set video mode.
  Input:
    AL=mode to set (see table below).
  Output:
    None.

32K/64K colors mode (option)
  AH=10, AL=F0
  BL=mode to set, 30 ---> 800x600 mode
                  2F ---> 640x400 mode
                  2E ---> 640x480 mode
                  2D ---> 640x350 mode

Mode	Type	Colors/ Shades	Alpha Formate	Buffer Start	Box Size	Max Pages	Display Size
0	A/N	16/256K	40x25	B8000	8x8	8	320x200
0*	A/N	16/256K	40x25	B8000	8x14	8	320x350
0+	A/N	16/256K	40x25	B8000	9x16	8	360x400
1	A/N	16/256K	40x25	B8000	8x8	8	320x200
1*	A/N	16/256K	40x25	B8000	8x14	8	320x350
1+	A/N	16/256K	40x25	B8000	9x16	8	360x400
2	A/N	16/256K	80x25	B8000	8x8	8	640x200
2*	A/N	16/256K	80x25	B8000	8x14	8	640x350
2+	A/N	16/256K	80x25	B8000	9x16	8	720x400
3	A/N	16/256K	80x25	B8000	8x8	8	640x200
3*	A/N	16/256K	80x25	B8000	8x14	8	640x350
3+	A/N	16/256K	80x25	B8000	9x16	8	720x400
4	APA	4/256K	40x25	B8000	8x8	1	320x200
5	APA	4/256K	40x25	B8000	8x8	1	320x200
6	APA	2/256K	80x25	B8000	8x8	1	640x200
7	A/N	4	80x25	B0000	9x14	8	720x350
7+	A/N	4	80x25	B0000	9x16	8	720x400
D	APA	16/256K	40x25	A0000	8x8	8	320x200
E	APA	16/256K	80x25	A0000	8x8	4	640x200
F	APA	4	80x25	A0000	8x14	2	640x350
10	APA	16/256K	80x25	A0000	8x14	2	640x350
11	APA	2/256K	80x30	A0000	8x16	1	640x480
12	APA	16/256K	80x30	A0000	8x16	1	640x480
13	APA	256/256K	40x25	A0000	8x8	1	320x200

Mode	Type	Colors/ Shades	Alpha Formate	Buffer Start	Box Size	Max Pages	Display Size
22	A/N	16/256K	132x44	B8000	8x8	2	1056x352
23	A/N	16/256K	132x25	B8000	8x14	4	1056x350
24	A/N	16/256K	132x28	B8000	8x13	4	1056x364
25	APA	16/256K	80x60	A0000	8x8	1	640x480
26	A/N	16/256K	80x60	B8000	8x8	3	640x480
29	APA	16/256K	100x37	A0000	8x16	1	800x600
2A	A/N	16/256K	100x40	B8000	8x15	4	800x600
2D	APA	256/256K	80x25	A0000	8x14	1	640x350
2D**	APA	32K	80x25	A0000	8x14	1	640x350
2D**	APA	64K	80x25	A0000	8x14	1	640x350
2E	APA	256/256K	80x30	A0000	8x16	1	640x480
2E**	APA	32K	80x30	A0000	8x16	1	640x480
2E**	APA	64K	80x30	A0000	8x16	1	640x480
2F	APA	256/256K	80x25	A0000	8x16	1	640x400
2F**	APA	32K	80x25	A0000	8x16	1	640x400
2F**	APA	64K	80x25	A0000	8x16	1	640x400
30	APA	256/256K	100x37	A0000	8x16	1	800x600
30**	APA	32K	100x37	A0000	8x16	1	800x600
30**	APA	64K	100x37	A0000	8x16	1	800x600
37	APA	16/256K	128x48	A0000	8x16	1	1024x768
38	APA	256/256K	128x48	A0000	8x16	1	1024x768
3D	APA	16/256K	160x64	A0000	8x16	1	1280x1024

A/N = Alphanumeric mode (text)
APA = All points addressable modes (graphics)
* = Extended graphics adapter text modes with 350 scan lines
\+ = 9x16 character cell enhanced text modes with 400 scan lines.
** = Requires a Sierra Semiconductor or compatible HICOLOR DAC

NOTES:

1. AL bit 7 can be 0 or 1. When set to 1, the MODE SET function does not clear the display buffer.

2. Default modes are 3+ for color monitor and 7+ for monochrome monitor.

3. Modes 0 through 6 emulate IBM color graphics adapter support.

4. Modes 0, 2,and 5 are identical to modes 1, 3,and 4 respectively.

5. There is no hardware cursor in graphics (APA) modes. Altering the hardware cursor type has no effect in these modes.

6. Selecting the number of scan lines in alpha-numeric modes is detailed under "(BL)=30H, Select Scan Lines for Alphanumeric Modes."

7. Use of the equipment flags variable at address 0:410 (applicable bits are <5,4>:

   * Binary XX11 XXXX = monochrome
   * Binary XX10 XXXX = color

   If there is more than one video adapter in the system, the equipment flag setting at the time of the set mode call determines if the mode should be set in the color or monochrome adapter. If necessary, color modes will be converted to mono-chrome mode 7 and monochrome modes to color mode 3.

   If there is only one adapter, then in EGA mode, the equipment flag forces a color or monochrome mode to be set with conversion if necessary.

   In VGA mode, the equipment flag automatically gets changed to agree with the mode being set.

AH=1 Set cursor type (start and stop scan lines)
   Input:
      CH=start scan line for cursor.
      CL=end scan line for cursor.
   Output:
      None.

      Note: Only bits 0 through 4 should be set.

AH=2 Set cursor position.
   Input:
      BH=page for which cursor is to be set.
      DH=row position cursor is to be set to.
      DL=column position cursor is to be set to.
   Output:
      None.

```
          Note: (0,0) is upper left of screen.

AH=3 Read cursor position.
   Input:
          BH=page for which cursor is to be read.
   Output:
          CH=current start scan line for cursor.
          CL=current stop scan line for cursor.
          DH=row position of cursor in selected page.
          DL=column position of cursor in selected page


AH=4 Read light pen position
   Input:
          None.
   Ouput:
          AH=0 then light pen switch not activated,
               return values invalid.
             1 then light pen switch activated, valid
               values returned.
          BX=pixel column.
          CH=raster line.
          CX=raster line (new graphics modes).
          DH=row of character light pen position.
          DL=column of character light pen position.


AH=5 Select active page.
   Input:
          AL=page to select as active page.
   Output:
          None.


AH=6 Scroll up active page.
   Input:
          AL=number of lines rows are to move up.
             0 means blank window.
          BH=attribute used to fill blank line or lines
             at bottom.
          CH=row of upper left corner of scroll window.
          CL=column of upper left corner of scroll
             window.
          DH=row of lower right corner of scroll window
          DL=column of lower right coner of scroll
             window.
   Output:
          None.
```

AH=7 Scroll down active page.
Input:
AL=number of lines rows are to move down.
0 means blank window.
BH=attribute used to fill blank line or lines at top
CH=row of upper left corner of scroll window.
CL=column of upper left corner of scroll window.
DH=row of lower right corner of scroll window
DL=column of lower right corner of scroll window.
Output:
None.

AH=8 Read character and attribute at cursor position.
Input:
BH=page to read from.
Output:
AH=attribute of character at cursor position.
AL=character read from cursor position.

Note: Attribute valid in text modes only. Only characters drawn in white matched in graphics modes.

AH=9 Write character and attribute at cursor position
Input:
AL=character to write at cursor position.
BH=page to write character and attribute to.
BL=attribute to write character with in text mode.
=foreground color in graphics mode.
CX=number of times to write character and attribute.
Output:
None.

Note: If bit 7 of BL is 1 in graphics mode, then the character is XOR'd into video memory, else the character displays the previous contents of video memory. (XOR not valid in 256 color modes.)
Note: In 256 color modes, the value passed in BH is used as the background color.

AH=0A Write character only at cursor position.

Input:
AL=character to write at cursor position.
BH=page to write character and attribute.
BL=(in graphics modes only) foreground color for character.
CX=number of times to write character and attribute.
Output:
None.

Note: See previous notes for function AH=9.

AH=0B Color select for color/graphics adapter compatible modes.
Input:
BH=0 means set the background color specified by BL.
<>0 means set the palette specified by BL.
BL=color value to be used:
* When setting the background color, BL selects any of the 16 colors with a value of 0-15 with bits 0-3.
* When selecting the palette, BL operates as follows:
bit 0=0 selects palette 0 (green/red/brown).
bit 0=1 selects palette 1 (cyan/magenta/white).
Output:
None.

Note: In text modes, the set background fucntion sets the border color only. In graphics modes, the set background function sets both the border and background colors.

Note: This function is implemented via emulation since the EGA does not have the same color registers as the color/graphics adapter.

Note: Actual operation is to set palette register 0 for background, palette register 11h for overscan, and palette registers 1-3 for palette colors 1-3. Palette registers are set in any graphics mode, although this was valid only in 320x200 graphics mode on the color/graphics adapter.

AH=0C Draw graphics pixel.
Input:
AL=color (actually attribute that goes to the palette RAM) to draw pixel in.
BH=page to draw pixel in.
CX=screen column to write pixel at.
DX=screen row to write pixel at.
Output:
None.

Note: If bit 7 of AL is 1, then the pixel is XOR'd with the contents of video memory (except in 256 color modes).

AH=0D Read graphics pixel color (actually attribute that goes to the palette RAM).
Input:
BH=page to read pixel from.
CX=screen column to read pixel from.
DX=screen row to read pixel from.
Output:
AL=pixel value read (attribute of pixel).

None: Interpretation of value returned depends on graphics mode in effect.

AH=0E Write TTY.
Input:
AL=character to write.
BL=color to draw character in graphics mode.
Output:
None.

Note: Carriage return, backspace, line feed, bell are commands but not displayed characters. Cursor is moved to the right after character is displayed, with wrap and scroll at right margin of screen.

```
AH=0F Return video information.
  Input:
        None.
  Output:
        AL=video mode in effect.
        AH=text columns supported in current mode.
        BH=active display page.

  Note: Bit 7 of AL is set to 1 if the regen buffer
        was not cleared when the mode was set.

AH=10 Set EGA palette registers.
   AL=0 set color for a single palette register.
        Input:
             BH=color to set palette register to.
             BL=palette register to set color of.
        Output:
             None.

   AL=1 set color for overscan (border color)
        register.
        Input:
             BH=color to set overscan register to.
        Output:
             None.

   AL=2 set colors for all 16 palette and the over-
        scan registers.
        Input:
          ES:DX=address of table organized as follows:
                bytes 0-15=colors for palette
                           registers 0-15.
                bytes 16=color for overscan register.
        Output:
             None.

   AL=3 select interpretation of intensity/blink att-
        ribute bit.
        Input:
             BL=0 select high intensity background.
                1 select blinking.
        Output:
             None.

   AL=4 reserved.

   AL=5 reserved.

   AL=6 reserved.
```

```
AL=7 read individual palette register.
     Input:
          BL=palette register to read (range 0 to
             15)
     Output:
          BH=value read.

AL=8 read overscan register
     Input:
          None.
     Output:
          BH=value read.

AL=9 read all palette registers and overscan.
     Input:
          ES:DX points to 17 byte table area.
     Output:
          bytes 0-15=palette values.
          bytes 16  =overscan value.

AL=10h set individual color register (external
       palette).
     Input:
          BX=color register to set.
          DX=red value to set.
          CH=green value to set.
          CL=blue value to set.
     Output:
          None.

AL=11h reserved.

AL=12h set block of color registers
     Input:
          ES:DX=pointer to table of color values
                in RGB format (i.e. 3 bytes for
                each entry).
          BX=starting index.
          CX=number of color registers to set.
     Output:
          None.
```

```
AL=13h select color page.
  BL=00 select paging mode.
     Input:
          BH=paging mode
               0 - selects  4 register pages of 64
                   registers
               1 - selects 16 register pages or 16
                   registers.
     Output:
          None.

  BL=01 select page.
     Input:
          BH=page value (0 to nn, where nn=3 in
             page mode 0 and nn=15 in page mode 1)

AL=14h reserved.

AL=15h read individual color register.
     Input:
          BX=color register to read.
     Output:
          DH=red value read.
          CH=green value read.
          CL=blue value read.

AL=16h reserved.

AL=17h read block of color registers.
     Input:
          ES:DX=pointer to destination for RGB
                table (3 bytes/entry).
          EX=starting index.
          CX=number of color registers read.
     Output:
          (ES:DX)=table.

AL=18h reserved.

AL=19h reserved.

AL=1Ah read color page state.
     Input:
          None.
     Output:
          BL=current paging mode.
          BH=current page.

AL=1Bh sum colors to gray shades (VGA only).
```

(This call reads R, G, and B values found in external palette ram and performs a weighted sum (30% red, 59% green and 11% bule), then writes the result into each R, G, and B component of color register (original data is overwritten).)

Input:

BX=starting index.
CX=number of color registers to sum.

AH=11 Font interface.

AL=0 load user font into soft font (text mode).

Input:

BH=# of bytes per character.
BL=# of soft font to load font into.
CX=# of characters to store.
DX=offset into table of first character to store
ES:BP=point to font to load.

Output:

None.

AL=1 load ROM monochrome font into soft font (text mode).

Input:

BL=# of soft font to load font into.

Output:

None.

AL=2 load ROM 8x8 double dot font into soft (text mode).

Input:

BL=# of soft font to load font into.

Output:

None.

AL=3 select fonts displayed (text mode).

Input:

BL=specification for high/low attribute bit 3:
bits 4,1,0 =soft font # selected when

```
                        attr bit 3 is 0.
                bits 5,3,2 =soft font # selected when
                        attr bit 3 is 1.
        Output:
             None.

AL=4 load ROM 8x16 font into soft font (text
     mode).
     Input:
          BL=# of soft font to load font into.
     Output:
          None.

     Note: The following functions AL=1X are the
           same as AL=0X, except:
           * The active page must be zero.
           * The char_height variable will be re-
             calculated as:
             INT((200|350|400)/char_height) - 1
           * Regen_length will be recalculated as:
             (crt_rows + 1) * crt_columns * 2
           * The CRTC will be reprogrammed as:
             Max scan line=char_height - 1
             Cursor start =char_height - 2
             Cursor end   =char_height - 1
              (cursor_type set via set_cursor_type
               BIOS function)
             Vert disp end=((crt_rows + 1) * char_
                            height) -1
              [char_height*2 above if double scan]
             Underline    =char_height - 1
              (mono modes only)

AL=10 load user font into soft font (text mode).
     Input:
          BH=# of bytes per character.
          BL=# of soft font to load font into.
          CX=# of characters to store.
          DX=offset into table of first character
             to store.
          ES:BP=pointer to font to load.
     Output:
          None.

AL=11 load ROM monochrome font into soft font
      (text mode).
     Input:
          BL=# of soft font to load font into.
     Output:
          None.
```

```
AL=12 load ROM 8x8 double dot font into soft font
      (text mode).
     Input:
          BL=# of soft font to load font into.
     Output:
          None.

AL=14 load ROM 8x16 font into soft font (text
      mode)
     Input:
          BL=# of soft font to load font into.
     Output:
          None.

AL=20 set user font chars 128-255 for color/
      graphics adapter compatibles modes
      (graphics).
     Input:
          ES:BP=pointer to font to load.
     Output:
          None.

AL=21 set user font (graphics).
     Input:
          BL=# of rows on screen, as follows:
               0 then DL=user specified # rows.
               DL=# rows.
                  1 then 14 rows.
                  2 then 25 rows.
                  3 then 43 rows.
          CX=character height.
          EX:BP=pointer to font to load.
     Output:
          None.

AL=22 set ROM 8x14 font (graphics).
     Input:
          BL=# of rows on screen, as follows:
             0 then DL=user specified # rows.
             DL=# rows.
                1 then 14 rows.
                2 then 25 rows.
                3 then 43 rows.

AL=23 set ROM 8x8 double dot font (graphics).
     Input:
          BL=# of rows on screen, as follows:
               0 then DL=user specified # rows.
               DL=# rows.
```

```
                    1 then 14 rows.
                    2 then 25 rows.
                    3 then 43 rows.

    AL=24 set ROM 8x16 font (grpahics).
        Input:
            BL=# of rows on screen, as follows:
                0 then DL=user specified # rows.
                DL=# rows.
                    1 then 14 rows.
                    2 then 25 rows.
                    3 then 43 rows.

    AL=30 return font information.
        Input:
            BH=0 return pointer to upper 128 graphic
                 characters. (INT 01Fh pointer-color
                 /graphics adapter compatible modes)
            BH=1 return pointer to graphics font
                 (INT 043h pointer).
            BH=2 return pointer to ROM 8x14 font.
            BH=3 return pointer to ROM 8x8 double
                 dot font.
            BH=4 return pointer to top half to ROM
                 8x8 double.
            BH=5 return  pointer  to  ROM   font
                 supplement
                 from 9x14 text.
            BH=6 return pointer to ROM 8x16 font.
            BH=7 return pointer to ROM font
                 supplement for  9x16 text.
        Output:
            CX=char_height.
            DL=crt_rows - 1.
            ES:BP=pointer to table selected by BH.

AH=12 Return  EGA  information  or select alternate
      printscreen handler.
   BL=10 return information.
        Input:
            None.
        Output:
            BH=0 color mode, addressed at 03DX.
              =1 monochrome mode, addressing at 03BX
            BL=installed video memory as follows:
               0 = 64K bytes installed.
               1 =128K bytes installed.
               2 =192K bytes installed.
               3 =256K (or more) bytes installed.
            CH=feature bits (bits 4-7 or info_1
```

```
            shifted right).
          CL=switches (bits 0-3 of info_1).

BL=20 select this BIOS's print screen routine,
      which supports all modes of this BIOS.
     Input:
          None.
     Output:
          None.

     Note: This function selects the  print screen
           routine built into this ROM to replace
           the standard BIOS print screen routine.

BL=30 select scan lines for text modes.
     Input:
          AL=scan lines to set (takes effect on
             next mode change).
             0 = 200 scan lines
             1 = 350 scan lines
             2 = 400 scan lines.
     Output:
          AL=12h.

BL=31 set default palette load.
     Input:
          AL=# enable/disable palette loading.
             0 = enable palette loading.
             1 = disable palette loading.
     Output:
          AL=12h.

BL=32 enable/disable video.
     Input:
          AL=# enable/disable video.
             0 = enable video.
             1 = disable video.
     Output:
          AL=12h.

BL=33 enable/disable gray scale summing.
     Input:
          AL=# enable/disable gray scale summing.
             0 = enable summing.
             1 = disable summing.
     Output:
          AL=12h.

BL=34 enable/disable cursor emualtion.
     Input:
```

```
                    AL=# enable/disable cursor emulation.
                       0 = enable emulation.
                       1 = disable emualtion.
               Output:
                    AL=12h.

          BL=35 select/deselect display
               Input:
                    Buffers for adapter and planar video are
                    initialized then:
                    AL=# select/deselect adapter/planar
                         video.
                       0 = initial deselect adapter video.
                       1 = initial select planar video.
                       2 = deselect active display.
                       3 = select inactive display.
                    ES:DX=pointer to 128-byte buffer.
               Output:
                    AL=12h.

          BL=36 enable/disable video output.
               Input:
                    AL=# enable/disable video output.
                       0 = enable video output.
                       1 = disable video output.
               Output:
                    AL=12h.

     AH=13 Write text string.
       Input:
          AL=0 text string is characters only.  Cursor not
               moved from original position.
               BL=attribute to write text string with.
             1 text string is characters only.  Cursor moved
               to end of text string.
               BL=attribute to write text string with.
             2 text string is alternating character/attribu-
               te sequence.  Cursor not moved from original
               position.
             3 text string is alternating character/attribu-
               te sequence.  Cursor moved to end of text
               string.

          BH=page to write text string to.
          CX=count of characters (not bytes) in string to
             display.
          DH=row position at which to start displaying
             string.
```

DL=column position at which to begin displaying string.
ES:BP=pointer to text string to be written.

Note: Scroll, backspace, carriage return, if any, will take place in the active page only.

AH=1A Read/write display code function.

Display combination codes:
00 - No display
01 - Monochrome with 5151
02 - CGA with 5153/4
03 - Resereved
04 - EGA with 5153/4
05 - EGA with 5151
06 - Professional Graphics System with 5175
07 - VGA with analog BW
08 - VGA with analog color
09 - Reserved
0A - System 30 with 5153/4
0B - System 30 with analog BW
0C - System 30 with color
0D to FE - Reserved
FF - Unknown

AL=0 Read display code.
Input:
None.
Output:
AL=1Ah.
BL=active display code.
BH=alternate display code.

AL=1 Write display code.
Input:
BL=active display code.
BH=alternate display code.
Output:
AL=1Ah.

AH=1B Return functionality/state information
Input:
Bx=implementation type.
ES:DI=buffer (40h bytes).
Output:
AL=1Bh.
Buffer, in the following format:

Offset	Type	Description
00	word	Offset to static functionality information
02	word	Segment to static functionality information
04	byte	Video mode
05	word	Number of columns on screen
07	word	Length of regen buffer
09	word	Start address of regen buffer (offset)
0B	8*word	Cursor position for 8 pages (row, column)
1B	word	Cursor mode setting (start, end)
1D	byte	Active page
1E	word	CRTC address
20	byte	Current setting of 3x8 register (mode register)
21	byte	Current setting of 3x9 register
22	byte	Rows on screen
23	word	Character height
25	byte	Active display combination code
26	byte	Alternate display combination code
27	word	Colors supported for current video mode
29	byte	Display pages supported for current video mode

Offset	Type	Description
2A	byte	Scan lines in current video mode 0=200 1=350 2=400 3=480 4=Reserved 5=600 (Note: IBM reserves this) 6=768 (Note: IBM reserves this) 7-255=reserved
2B	byte	Primary character block 0=block 0 1=block 1 . . . 255=block 255
2C	byte	Secondary character block
2D	byte	Miscellaneous state information 0-1=all modes on all monitors active 1-1=summing active 2-1=monochrome active 3-1=mode set default palette loading disabled 4-1=cursor emulation active 5-0=background intensity/ 1=blinking 6-7=reserved
2E	byte	Reserved
2F	byte	Reserved
30	byte	Reserved
31	byte	Video memory available 0 = 64KB 1 = 128KB 2 = 192KB 3 = 256KB 4-255 = reserved
32	byte	Save pointer state information 0 512 character set active 1 dynamic save area active 2 alpha font override active 3 graphics font override active 4 palette override active 5 DCC extensior active 6-7=reserved
33-3F	byte	Reserved

Format of static functionality table:

bit flags: 0=not supported
1=supported

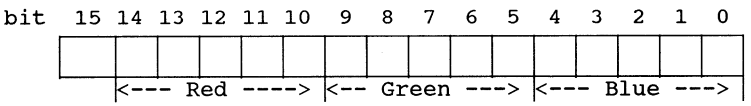
Offset	Type	Description
00	byte	Bit Video modes 0 mode 0 1 mode 1 2 mode 2 3 mode 3 4 mode 4 5 mode 5 6 mode 6 7 mode 7
01	byte	Bit Video modes 0 mode 8 1 mode 9 2 mode A 3 mode B 4 mode C 5 mode D 6 mode E 7 mode F
02	byte	Bit Video modes 0 mode 10 1 mode 11 2 mode 12 3 mode 13 4-7 reserved

Offset	Type	Description
03-06	byte	Reserved
07	byte	Bit Scan lines available in text mode 0 200 scan lines 1 350 scan lines 2 400 scan lines 3-7 reserved
08	byte	Character blocks available in text mode
09	byte	Maximum number of active character blocks in text modes
0A	byte	Bit Miscellaneous functions 0 all modes on all monitors 1 summing 2 character font loading 3 mode set default palette loading 4 cursor emulation 5 EGA palette 6 color palette 7 color paging
0B	byte	Bit Miscellaneous functions 0 light pen 1 save/restore 2 background intensity/ blinking control 3 DCC 4-7 reserved

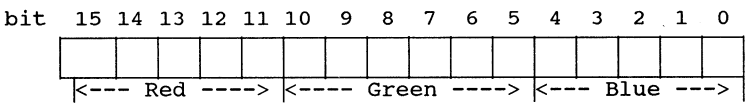
Offset	Type	Description
0C	byte	Reserved
0D	byte	Reserved
0E	byte	Bit Save pointer functions 0 512 character set 1 dynamic save area 2 alpha font override 3 graphics font override 4 palette override 5 DDC extension 6-7 reserved
0F	byte	Reserved

```
AH=1C Save/restore video state
  AL=0 Return save/restore state buffer size
     Input:
          CX=requested states
     Output:
          AL=1Ch
          BX=# of 64 byte blocks needed for save buffer

  AL=1 save state
     Input:
          CX=requested states
          ES:BX=pointer to save area
     Output:
          (ES:BX) area modified
          AL=1Ch

  AL=2 Restore state
     Input:
          CX=requested states
          ES:BX=pointer to save area
     Output:
          AL=1Ch
          Requested states in CX - defined as follows:
          bit  0=1 - save/restore video hardware state
          bit  1=1 - save/restore video BIOS date area
          bit  2=1 - save/restore video external palette
          bits 3-F=reserved.
```

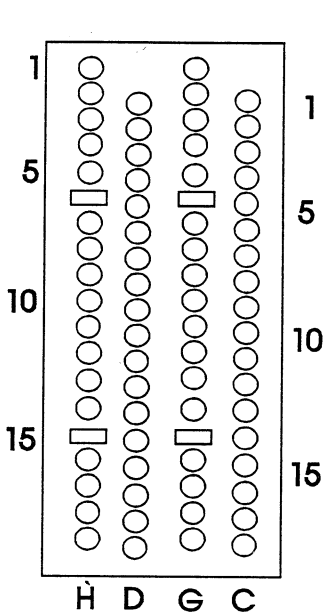
32K colors data format:

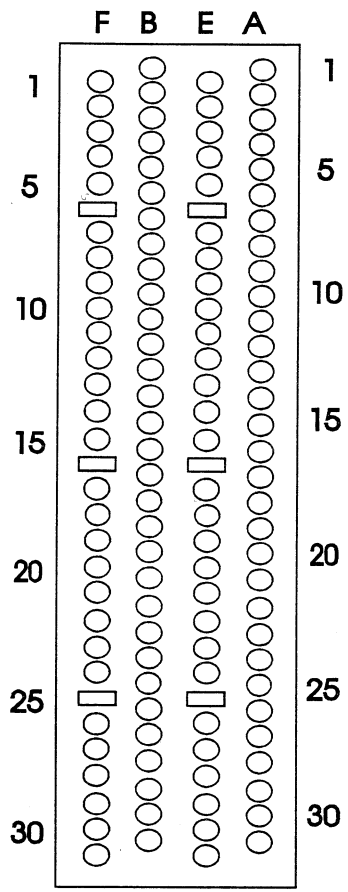


64K colors data format:



4-3 Local Bus/AT Bus Pin Assignment





ROW F		ROW B		ROW E		ROW A	
1	CA<2>	1	GND	1	GND	1	NOT USE
2	CA<4>	2	RESDRV	2	CA<3>	2	D<7>
3	CA<6>	3	+5V	3	CA<5>	3	D<6>
4	CA<8>	4	IRQ<9>	4	CA<7>	4	D<5>
5	+5V	5	NOT USE	5	CA<9>	5	D<4>
ACCESS KEY		6	NOT USE	ACCESS KEY		6	D<3>
7	CA<10>	7	NOT USE	7	GND	7	D<2>
8	CA<12>	8	NOT USE	8	CA<11>	8	D<1>
9	CA<14>	9	NOT USE	9	CA<13>	9	D<0>
10	CA<16>	10	GND	10	CA<15>	10	CHRDY
11	+5V	11	SMWTC*	11	CA<17>	11	AEN*
12	CA<18>	12	SMRDC*	12	GND	12	NOT USE
13	CA<20>	13	IOWC*	13	CA<19>	13	NOT USE
14	CA<22>	14	IORC*	14	CA<21>	14	NOT USE
15	CA<24>	15	NOT USE	15	CA<23>	15	NOT USE
ACCESS KEY		16	NOT USE	ACCESS KEY		16	NOT USE
17	+5V	17	NOT USE	17	CA<25>	17	SA<14>
18	DRAMS*	18	NOT USE	18	GND	18	SA<13>
19	RST4*	19	NOT USE	19	GND	19	SA<12>
20	+5V	20	NOT USE	20	RDY*	20	SA<11>
21	BE*<2>	21	NOT USE	21	BE*<3>	21	SA<10>
22	BE*<0>	22	NOT USE	22	BE*<1>	22	SA<9>
23	NOT USE	23	NOT USE	23	GND	23	SA<8>
24	M/IO*	24	NOT USE	24	NOT USE	24	SA<7>
ACCESS KEY		25	NOT USE	ACCESS KEY		25	SA<6>
26	W/R*	26	NOT USE	26	ADS*	26	SA<5>
27	+5V	27	NOT USE	27	NOT USE	27	SA<4>
28	SCLK	28	NOT USE	28	RDYO*	28	SA<3>
29	LDEV*	29	NOT USE	29	GND	29	SA<2>
30	CD<31>	30	NOT USE	30	CD<30>	30	SA<1>
31	CD<29>	31	GND	31	CD<28>	31	SA<0>
Local Bus		AT Bus		Local Bus		AT Bus	

ROW H		ROW D		ROW G		ROW C	
1	CD<27>	1	M16*	1	GND	1	SBHE*
2	+5V	2	IO16*	2	CD<26>	2	NOT USE
3	CD<25>	3	NOT USE	3	CD<24>	3	NOT USE
4	CD<23>	4	NOT USE	4	CD<22>	4	NOT USE
5	CD<21>	5	NOT USE	5	CD<20>	5	NOT USE
ACCESS KEY		6	NOT USE	ACCESS KEY		6	NOT USE
7	CD<19>	7	NOT USE	7	CD<18>	7	NOT USE
8	CD<17>	8	NOT USE	8	CD<16>	8	NOT USE
9	CD<15>	9	NOT USE	9	GND	9	NOT USE
10	+5V	10	NOT USE	10	CD<14>	10	NOT USE
11	CD<13>	11	NOT USE	11	CD<12>	11	D<8>
12	CD<11>	12	NOT USE	12	CD<10>	12	D<9>
13	CD<9>	13	NOT USE	13	CD<8>	13	D<10>
14	CD<7>	14	NOT USE	14	GND	14	D<11>
ACCESS KEY		15	NOT USE	ACCESS KEY		15	D<12>
16	+5V	16	+5V	16	CD<6>	16	D<13>
17	CD<5>	17	MASTER*	17	CD<4>	17	D<14>
18	CD<3>	18	GND	18	CD<2>	18	D<15>
19	CD<1>			19	CD<D>		
Local Bus		AT Bus		Local Bus		AT Bus	

CHAPTER 5

TROUBLESHOOTING

If you have problem after installation, it is most probably caused by follows.

a. Ensure that all cables are properly connected, and all plugs are firmly seated in their sockets.

b. Ensure that the display monitor is properly connected and its power is turned on.

Power OFF the computer system and all other connected devices before checking the following:

c. Ensure that the board is seated in the expansion slot.

d. Ensure that the system mother board switches/jumper(s) are set properly for use with the Enhanced VGA.

e. Ensure that no other switch settings on the mother board have been accidentally changed. Refer to the documentation provided with your computer to determine the correct switch settings.

If there is no problem after checked above items, there may be a malfunction of the computer system, display monitor or the Enhanced VGA.

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